ICAR.12.53
1,670

ANNUAL REPORT

OF THE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

FOR

1952-53

PUBLISHED BY THE MANAGER OF PUBLICATIONS, DELHI
PRINTED BY THE GOVERNMENT OF INDIA PRESS, CALCUTTA
1954

Price : Rs. 3-6 or 5 sh. 6 d.

ANNUAL REPORT
OF THE
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
FOR 1952-53, PLACED BEFORE THE SOCIETY
AT THE ANNUAL GENERAL MEETING
HELD ON FEBRUARY 10, 1954,
AT NEW DELHI

CONTENTS

	Page
Summary	i—ix
Chapter I—Administration	
General	1
Finance and Accounts	1
Meetings	1
Official Changes	1
Allotment of funds	1
Chapter II—Agricultural Research	
General	2
Agronomy and Soil Research	6
Botany and Plant Physiology	11
Insect Pests and Plant Diseases	14
Rice	19
Wheat and Barley	24
Millets	29
Maize	30
Pulses	34
Fruits	38
Vegetables and Tuber Crops	40
Spices and Condiments	43
Medicinal Plants	45
Chapter III—Animal Husbandry Research	
General	46
Cattle Breeding	48
Sheep Breeding	50
Goat Breeding	52
Poultry	54
Animal Nutrition	55
Disease Control	56
Dairying	61
Hides and Skins	65
Apiculture	66
Fish and Fisheries	67
Other Items	68

Page

CHAPTER IV—AGRICULTURAL AND ANIMAL HUSBANDRY RESEARCH

Fodder and Grazing 69

CHAPTER V—STATISTICAL RESEARCH

Advisory work 71
Training and Research 75
Other Items 75

CHAPTER VI—EXTENSION SERVICE

Pilot Development Projects 77
Extension Training Centres 77
Land Army 77
Crop Competitions 77
Other Items 78

CHAPTER VII—PUBLICATIONS AND PUBLICITY

Publications 82
Publicity 83

CHAPTER VIII—GENERAL

Library 85
Appendices I to XX 87-189

SUMMARY

THE 23rd Annual Report of the Indian Council of Agricultural Research gives a general review of the activities of the Council during the year 1952-53.

There were certain changes in the organization of the Council this year. Shri K. R. Damle, Joint Secretary to the Government of India, Ministry of Food and Agriculture and *ex-officio* Joint Vice-President of the Council succeeded Sardar Datar Singh as Vice-President of the Council. Dr B. N. Uppal took over as Agricultural Commissioner with the Government of India vice Shri R. L. Sethi, who retired from service last year.

Fifty-nine meetings of the various organisations of the Council were held during the year.

A joint meeting of the appropriate committees of the Indian Council of Agricultural Research and the Council of Scientific and Industrial Research was held on April 9, 1952 to consider the report on the scheme sanctioned to assess the nutritive value of *vanaspati* in relation to *ghee*.

The first meeting of the Indian Council of Agricultural Education was also held in April at Hyderabad with a view to co-ordinating agricultural education in the country, so that a uniform standard could be attained consistent with the present requirements of the country. A Standing Committee was set up in order to ensure continuity in the working of the Council.

In May, 1952, the Boards of Research and Extension met at Indore and considered measures for bringing out the publications of the Council in time. In June, 1952, a scheme for the production of fuel gas from cow dung and night soil was sanctioned.

A dairy was established in September, 1952 in the premises of the Indian Agricultural Research Institute, New Delhi under the Indian Council of Agricultural Research Pilot Scheme for supplying good quality milk to Delhi citizens at reasonable rate. It is being equipped with modern and uptodate scientific pasteurization and refrigeration machines. In November, 1952, a pilot survey for collection of fish-catch on the 300 mile strip of the south-east coast of Madras State was initiated.

An All-India Agricultural Information Conference was held by the Council at Lucknow from 17th to 19th November, 1952. The Conference recommended the setting up of an Agricultural Information Organisation to disseminate agricultural information through various media and methods.

The Advisory Board of the Council met in December, 1952 for examining the various research schemes relating to agriculture and animal husbandry. A small committee was set up by the Research Board of the Council to examine the initiation of soil conservation measures in the country.

A conference on 'Agricultural Implements and Machinery' was held on January 8-9, 1953. It recommended the setting up of Advisory Committees both at the Centre and in the States to encourage the use of improved agricultural implements.

The Prime Minister of India inaugurated a joint convocation of the Statistical Unit of the Council and that of the Indian Agricultural Research Institute on January 6, 1953 and gave away the Diplomas to successful students and certificates of '*Krishi Pandit*' and prizes to the winners in the all-India crop competitions.

A conference of agricultural statisticians and other technical officers in the States and at the Centre was held in February, 1953. The conference discussed problems relating to the planning of agricultural research, preparation of research programmes, laying of experiments and other important problems.

The fourth meeting of the Veterinary (Disease) Investigation Officers and research workers of various States was held under the auspices of the Council at Poona from March 5-7, 1953. It discussed problems relating to the control of various diseases of livestock and recommended measures to bring about improvement in the methods practised at present and suggested future lines of works.

The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India also met at Poona from March 9-17, 1953. It discussed problems relating to livestock, animal health and dairying. Amongst other things it recommended a special Key Village Scheme including all types of livestock developments for the Community Project Areas.

A conference of the Officers-in-charge of milk supply schemes was held at Poona on March 6, 1953. The officers discussed problems encountered by them in working milk supply schemes.

A campaign to popularise Japanese method of paddy cultivation was initiated and in this connection a meeting of the officers-in-charge of the campaign in various States was held early in March, 1953. The Conference finalised the plans for launching the country-wide campaign, and also discussed plans for distribution of seeds, fertilizers, etc.

The Spices Enquiry Committee set up under the auspices of the Council to enquire into the problems of production and marketing of some of the important dollar-earning crops of South India like pepper, ginger, turmeric cardamom, cashew-nut and lemon-grass completed its enquiry and tour of the principal producing areas during the year. The evidences gathered are being analysed with a view to preparing the final report of the Committee.

Agricultural Research

Agronomy and soil research

A series of manurial and agronomic trials were performed based on the recommendations of Dr Stewart. In Madras, it was found that optimum yield of paddy was attained by manuring at the rate of 30 lb. nitrogen (as ammonium sulphate) per acre over a basal dressing of 4,000 to 5,000 lb. of green leaves manure.

Synthesis and manufacture of chemicals of the hormone type was undertaken at National Chemical Laboratory, Poona, and in Madras and the Bose Institute. Actual trials, in connection with eradication of weeds by the use of chemicals, were started towards the close of the year. Three more centres for field work in Madhya Bharat, Bhopal and Himachal Pradesh were sanctioned.

Investigations carried out on the part played by minor and trace elements at the Indian Agricultural Research Institute revealed that deficiency in calcium and zinc were responsible for disease in Malta and *santra*. The soil of the diseased area of the Jamalpur Fruit Garden (Punjab) was found acidic, whereas that of the healthy area was alkaline. Further work on nitrogen fixation in soil confirmed that *arahar* (*Cajanus cajan*) does not depend for its nitrogen on the root-nodule organisms. For increasing the yield, inoculating the soil with the soil samples from gramgrowing area proved more effective than inoculating the nodule organisms in the seed.

Botany and plant physiology

In the scheme for investigation of physiological and biochemical changes induced by pre-sowing hardening treatment of crop seeds, it was found that the treatment accelerated germination and the rate of seedling growth. Other important and interesting physiological changes were also noted. For example, it was noticed that chilling of seeds induced earliness in flowering.

Insect pests and plant diseases

Tests with DDT, BHC and other allied insecticides were continued at Indian Agricultural Research Institute, New Delhi, and in Uttar Pradesh and Bombay. At the Indian Agricultural Research Institute, the toxicity of these insecticides was found to be the highest beginning first with Parathion and decreasing with Aldrin, Dieldrin, BHC, DDT, and Chlordon in the order given. In spraying trials, it was found that suspensions of Toxaphene were better than emulsions of DDT or BHC of the same strength. At Bombay, it was found that Toxaphene plus sulphur gave 96·1 per cent control over the mangohoppers. For killing fly larvae BHC and Toxaphene in 1-3 per cent strengths proved effective. Experiments were also conducted on insect pests of stored cereals. BHC and DDT films were found to be very effective for destroying these insect pests.

A research scheme on termites was initiated at Forest Research Institute, Dehra Dun. Research work in connection with plant virus diseases started also at Delhi and Simla Centres.

Cereals and other crops

Rice. During the year 12 schemes were in progress in the various parts of the country on breeding, agronomy manuring and pests and diseases, while 11 new schemes were sanctioned for the next year. As a result of breeding experiments, a number of rice varieties were produced suitable for varying environmental conditions, resistant to attack of various pests and diseases and giving high yields.

In the Kashmir Scheme, some of the Russian and American varieties were found to mature early. Rice breeding experiments in the Punjab revealed that early and medium varieties of 110 to 130 days duration were suitable for conditions obtaining in the Punjab.

In the Central Rice Research Institute at Cuttack, 112 cross combinations were completed in the scheme for hybridization between *japonica* and *indica* rices. The hybridization trials have been undertaken for stepping up yield.

In Madras two blast resistant strains Co. 25 and Co. 26, with high yields were released to the farmers. Regarding foot-rot disease, it was found that complete control could be ensured by treating seed with Agrosan GN or other organo-mercury fungicides.

Wheat and barley. As the rust disease is a serious menace, limiting production of wheat in India, the Council concentrated its attention this year on the investigation of wheatrust. Five hundred and seventy two cultures of wheat received from the U.S.A. were artificially infected in the adult stage with a mixture of all the races of three rusts at the Indian Agricultural Research Institute, New Delhi. Of these 82 were found to be resistant to all the three rusts simultaneously. These resistant cultures will now be tested under field conditions.

Besides the schemes on rust control, the Council sanctioned a new scheme for studies on the chemical composition and nutritive value of wheat at the Indian Agricultural Research Institute, New Delhi from April 1, 1953.

Millets. Three schemes were in operation during the year on major millets *bajara* and *jowar*, two in Madras and one in Saurashtra. In the scheme for the breeding of *jowar* varieties resistant to the parasitic weed *Striga*, promising results were obtained at different stations in Madras.

In Hybrid *Cumbu* Scheme in Madras some promising short duration strains of *bajara* (*Pennisetum typhoides*) were evolved giving higher yields than the locals.

At Kanpur *sawan* (*Panicum crusgalli*) T. 46 gave a high yield of about 2,000 lb. per acre. The strain 15A/1 of *kodon* (*Paspalum scrobiculatum*) gave significantly higher yield (1052·2 lb. per acre) than the local (837·5 lb. per acre) at Gorakhpur (U.P.).

Maize. At Jullundur Q. 716, an exotic hybrid gave very high yield as compared to the local. At Katrain also some exotic varieties gave very promising results. Experiments on seed treatment revealed that seeds treated with fungicides gave significantly higher yields than the untreated ones. Experiments undertaken in Bihar revealed that maize crop could also be grown there during winter months, if irrigation facilities were available. In case no irrigation was possible, it could be grown as a fodder crop.

Pulses and beans. In view of the nutritive value of pulses a co-ordinated scheme of research was in progress in the country. In addition to the breeding experiments, the value of pulses in rotation and mixed cropping was also investigated.

Investigations in Madras State produced some high yielding strains of red gram (*Cajanus cajan*). Type 37 maintained its superiority in ryots' fields also and will now be released as an approved strain. Promising strains of horse gram (*Dolichos biflorus*), green gram (*Phaseolus aureus*) and red gram were also produced at other research stations. Experiments with different varieties of field bean (*Dolichos lablab*), moth bean (*Phaseolus aconitifolius*), lentil (*Ervum lens*), peas (*Pisum sativum* and *P. arvense*) resulted in the isolation of some very high yielding strains.

Experiments on control of gram wilt in the Punjab revealed that subsoiling was very effective in controlling the disease.

Fruits. Five mango plants were successfully raised from seeds imported from Indonesia. Hybridization between north and south Indian varieties of mango was conducted at Hyderabad Research Station to evolve suitable hybrids with good characters.

Experiments were in progress to produce better varieties of banana and grape vine at Aduthurai and Hyderabad Research Stations respectively. Experiments to induce seedlessness in Allahabadi guava were also undertaken.

A new chemical method of processing papaya was developed. Training schemes in fruit and vegetable preservation were conducted in Assam and Bihar.

Vegetables and tuber crops. Seven research schemes were in progress in various States to evolve better varieties of tuber crops. A scheme for the development work on potatoes was sanctioned for a period of five years at the Central Potato Research Institute, Patna. Varietal trials of sweet potato (*Ipomoea batatas*), tapioca (*Manihot utilissima*), as well as of tomato, *bhindi*, brinjal, etc., established some high yielding varieties of these crops.

Spices and condiments. Experiments in Madras on control of clump-rot disease in cardamom, which has now spread throughout South India causing heavy damage to the crop, revealed that nicotine sulphate (0·05 per cent.) applied as a spray and dusting with Gammexane D. 025 were very effective and economical in controlling thrips, which cause the disease. Experiments were also in progress on the fungous diseases of turmeric, and coriander. Varietal trials of ginger proved that Walluvanad variety was the best, giving a yield of 13,050 lb. per acre.

Medicinal plants. The Council sanctioned two schemes, one in Kashmir and the other in Assam, on medicinal plants. In Assam, a third scheme for ergot cultivation was also sanctioned.

Animal Husbandry Research

Livestock breeding

The pilot Key Village Scheme and the artificial insemination centre for livestock, sanctioned by the Council for the Delhi State, were continued.

At the Indian Dairy Research Institute, Bangalore, the scheme for putting milch cows to work, continued to function satisfactorily. It was however premature to draw any definite conclusion from the experiments at present.

The scheme on the study of the breed characteristics of the various grey breeds of cattle, was completed during the year. The proposals in connection with research on artificial insemination of cattle in the country and the selection of places for the location of regional centres were finalised. A scheme was sanctioned for the investigation of pregnancy diagnosis tests in animals for a period of one year. The scheme will be in operation in Calcutta, Bangalore and Izatnagar.

The Council sanctioned another scheme for Himachal Pradesh to improve the cattle of that area.

The various sheep and goat breeding schemes financed by the Council showed steady progress. A diploma course for training in sheep and wool

production was instituted at the Government Livestock Farm, Hissar for a period of one year. A scheme was sanctioned for developing mutton breeds of sheep at Bombay, Mysore and Madras.

Angora Goat Breeding Scheme, on its transfer from the Punjab to Uttar Pradesh, was in progress at Pipalkoti. Angora goats were acclimatised to the new environments.

Animal nutrition

Experiments on indigenous grasses and leafy fodders at Indian Veterinary Research Institute revealed that *khair* leaves could be made use of as maintenance ration. *Kusum*, *phaldu* and *sal* leaves could be used with *bhoosa* and rape-cake. *Mororfali* and *gauj* leaves were also found to be nutritious feeds.

Disease control

Schemes for the investigation of diseases of cattle, sheep and goats and poultry made considerable progress. In the pilot scheme on control of rinderpest, 14013 animals includng cattle, buffaloes, sheep and goats were vaccinated using lapinised virus and lapinised goat reactor virus in different parts of the country and the immunity conferred by them under different conditions was studied. Investigations were made to find out the relative importance of different organisms involved in the causation of mastitis and to determine the efficiency of different chemo-therapeutic agents.

Various strains of viruses causing the foot and mouth disease and suitable methods of vaccination for the control of the same were studied at the Indian Veterinary Research Institute. Some brews prepared gave satisfactory results in the laboratory. Brucelliosis was another important disease investigated in various States. A large number of animals were tested to find out its incidence. Investigations revealed that control over the disease could be brought by segregation, transfer of reactors and by calfhood vaccination with strain 19 vaccine. To find out the incidence of tuberculosis in animals, a large number of cattle were tuberculine-tested in various States. At Mukteswar by repeated tests and elimination of reactors, a tuberculin-negative herd was established. Sheep and goat pox was found to be very prevalent in Bombay and several other States. Vaccination gave satisfactory results. Other important diseases investigated were rickettsiosis, bovine pleuropneumonia, Johne's disease, agalactia and diseases caused by anaerobes.

Under the Council's schemes for heleminthic infestation of cattle, sheep and goats, the life-histories of some important parasites were studied. A new scheme for the control of nasal schistosomiasis and fascioliases diseases of bovines was sanctioned.

Under the poultry heliminths scheme at the Indian Veterinary Research Institute, natural and acquired resistance of birds to worm infestation was studied. A new scheme for the control of coccidiosis in poultry was also sanctioned for three years at the Indian Veterinary Research Institute.

Dairying

For fixing standards, a large number of milk samples were analysed and tested. Comprehensive investigation on the incidence and distribution of

heat resistant micro-flora in milk, which govern its keeping quality, was made. Contamination from utensils and insanitary methods of handling milk were found to be serious factors in bringing down the quality of milk. The preparation of desiccated cultures of starter organisms and microbiological deterioration of butter were also studied.

A new method of manufacture of *ghee, i.e.*, pre-stratification in newly designed boiler proved more economic and hygienic and produced *ghee* of a better taste. Experiments were also conducted for better preservation of raw butter. Phytosterol acetate was found most sensitive and reliable for detecting the presence of *vanaspati* in *ghee*.

Hides and skins

Studies on the incidence and nature of damage caused by various species of ticks and allied parasites to hides and skins and their control were continued at the Indian Veterinary Research Institute. Further trials were conducted to assess the tickicidal value of several acaricidal drugs.

Apiculture

Important investigations were made in the field of apiculture. At the Regional Bee Research Station, Katrain, strains of bees were selected, which yielded about 12 lb. honey per hive. At the Coimbatore Research Station nine new bee pasturage plants were recorded. Yellow of an egg with honey was found to be the best artificial feed and colonies fed on this substance yielded 30 per cent more honey.

Fish and fisheries

A wide survey of the various pests associated with stored fish was conducted and their methods of infestation and factors inducing infestation, as well as different possibilities of controlling and preventing them were explored. Two pests, *Dermestes ater* De Geer and *Lardoglyphus hughesi* sp. nov. were found to be most common and serious.

Agricultural and Animal Husbandry Research

Fodder and grazing

A co-ordinated scheme for pasture land improvement was prepared by Dr R. O. Whyte, whose services were loaned to this Council by F. A. O. Studies on *kudzu* vine at the Indian Agricultural Research Institute revealed that the Assam variety was resistant to low temperatures. This winter hardiness may prove interesting for a breeding programme in combining the qualities of winter hardiness with better growth characteristic of the U.S. varieties.

Extension Service

Fifteen pilot development projects, which were sanctioned last year in the different States functioned quite satisfactorily and helped a good deal to convey information on improved farm practices to the rural masses through multipurpose village level workers. The extension workers by their own example and manual labour, demonstrated the results of research in agriculture,

health, education and social organisation and assisted the farmer to adopt the improved practices.

Thirty-four training centres were set up to train key extension personnel. In addition, with financial assistance from the Ford Foundation certain selected agricultural colleges were helped to establish extension wings to impart to agricultural graduates practical training in agricultural methods under village conditions. Also five schemes were sanctioned for organising short term refresher courses in State agricultural institutions, both private and Government controlled, for the benefit of young farmers. The Council also decided to send 15 young Indian farmers to the U.S.A. under the International Farm Youth Exchange Programme. A batch of 21 extension officers from various States visited the U.S.A. and Japan for a study tour of extension methods and practices for ten weeks.

A short course in adult literacy was given by Dr Laubach at Nilokheri from August 1 to 7, 1952. Representatives of education and agriculture departments from various States attended the course. Land army units were formed in majority of States and they did useful work in implementing agricultural programme in an organised manner.

Prizes were awarded to the winners of the different crop competitions organised in 1951-52. For the year 1952-53, it has been decided that the farmers who stand out in State competitions should compete among themselves for the All-India Crop Competition award. It is also being considered, that besides the all-India prizes, there should be community prizes for the best village, *tehsil*, district, and State in respect of crop yield performance.

In view of the high yields obtained by the Japanese method of paddy cultivation, the Government of India decided to launch a country wide campaign during the *kharif* season of 1953 for stepping up rice production.

Statistical Research

The Statistical Branch continued its advisory and teaching work. Crop-cutting surveys on cereals and non-food crops (jute and oilseeds) were continued, as also the assessment of the results of 'Grow More Food' campaign. The work relating to the five-year co-ordinated scheme of crop cutting experiments on principal food crops and the 'Grow More Food' assessment surveys, which was hitherto done by the Council was, however, transferred to the Department of Economic Affairs. A sample check of the masonary wells constructed under 'Grow More Food' campaign since 1947-48 was undertaken in several States.

A five-year scheme for the improvement of statistics relating to livestock and fisheries was sanctioned by the Government of India. It is expected that at the end of the five-year period, definite sampling techniques will have been evolved.

A pilot survey of the cost of production of cotton, *jowar* and groundnut in Akola District of Madhya Pradesh and a preliminary enquiry relating to the cost of production of milk in rural and urban areas in Delhi State were undertaken by the Council. A critical statistical study of the data collected at Indian Dairy Research Institute, Bangalore and Livestock Research Farm,

Hissar was made for an appraisal of the cattle breeding programmes. The data collected in connection with two sheep improvement schemes of the Council at the above stations were also critically examined. Research for evolving sampling methods to study length, fineness and medullation of wool were continued.

Two fellowships were awarded for research work in agriculture and animal husbandry statistics. Three officers of the Branch participated in training work under international bodies of the F.A.O. Two statistical experts, Dr Finney and Dr Yates worked for some time in the Statistical Branch during the year.

The Council decided to admit foreign students from South-east African countries to statistical classes conducted by it.

Publications and Publicity

Indian Farming, Kheti and the scientific journals of the Council continued to be published. Useful information in the form of interesting feature articles, topical notes including hints to the farmers, suggestions on health problems, etc. made Indian Farming and Kheti of great value to the farmers. Statistical News Letter and Horticultural Abstracts also continued to be published.

A new quarterly journal 'Rice News Teller' was started in January, 1953 to report the progress of research and development work connected with rice.

CHAPTER I

ADMINISTRATION

THIS is the 23rd Annual Report of the Indian Council of Agricultural Research presented by its Governing Body under Rule 64 of the Rules of the Council, giving a general review of the activities of the Council during the year 1952-53.

Finance and Accounts

The following were the receipts from (i) the cess levied under the A. P. Cess Act, 1940, (ii) the grants received from the Government of India and (iii) the grants received from other sources :—

(i) Receipts from the A. P. Cess	Rs. 42,60,500
(ii) Grants received from the Government of India for the following schemes :	
(*a*) Livestock and Fisheries Statistics	42,200
(*b*) Wheat Rust Control	77,150
(*c*) Production of Fuel Gas from Cattle Dung	22,200
(*d*) Publicity with regard to Japanese Method of Paddy Cultivation	61,500
(*e*) Jute Crop Cutting Experiments	4,000
(*f*) Preliminary Enquiry in connection with the Sample Survey of Cultivators Holdings	8,000
(iii) Grants from other sources :—	
(*a*) From Food Procurement Bonus to States for Crop-cutting Experiments	2,17,510
(*b*) From Central Commodity Committees and All-India Women's Food Council to the Publicity Fund.	18,000

A statement showing the audited accounts of the Council for the year 1952-53 is appended (Appendix XX).

Meetings

Fifty-nine meetings of the various organisations of the Council were held during the year (Appendix I). The Prime Minister of India inaugurated a joint convocation of the Statistical Unit of the Council and that of the Indian Agricultural Research Institute and gave away the diplomas to successful students and certificates of '*Krishi Pandit*' and prizes to the winners in the All-India crop competitions.

Official Changes

There were a few changes in the organisation. Shri K. R. Damle, Joint Secretary to the Government of India, Ministry of Food and Agriculture and *ex-officio* Joint Vice-President of the Council succeeded Sardar Datar Singh as Vice-President of the Council. Dr B. N. Uppal took over as Agricultural Commissioner with the Government of India vice Shri R. L. Sethi, who retired from service last year.

Allotment of funds

The Council sanctioned the continuation of 60 current schemes at a cost of Rs. 30·52 lakhs. One hundred twenty four new schemes were sanctioned at a cost of Rs. 34·46 lakhs. Thirty-three schemes terminated during the year.

CHAPTER II

AGRICULTURAL RESEARCH

General

As in the previous year the State governments, central research institutes, commodity committees and commodity research stations submitted brief technical reports of the work done by them and future programmes of work. These reports and programmes were scrutinised by the scientific committees along with the reports and programmes of the schemes financed by the Council and suggestions were made to develop research on a co-ordinated basis in the country.

It was decided that the work done under the extended scheme for manurial trials in cultivators' fields in Bihar might be extended to other States. Madras and West Bengal were already carrying on such trials under a scheme financed by the Council. The States of Bombay, Punjab, PEPSU, Orissa and Bhopal proposed to take up this work in 1953.

A note on ' Soil Research in India 1951 ' was prepared from the material contained in the reports received. This note was approved and it was recommended that such a note should be prepared annually. Copies of the note were circulated to the State agricultural chemists and arrangements ware made to prepare such a note annually.

Regarding the work on manuring and cultural practices of crops carried out so far in the country, it was felt that it had not been planned in a co-ordinated manner. It was, therefore, decided that a review of agronomic work done in the past should be prepared and that a special committee should draw up model agronomic experiments to be undertaken at different research stations in the country.

Although improved varieties were under multiplication and distribution by State governments, the extent of such coverage including natural spread was not correctly known. Attempts would, therefore, be made to get an idea of the area under improved varieties from the Community Project Areas in the first instance. This was brought to the notice of the Community Project Administration for implementation.

Following the recommendation of the Directors' Conference held in March 1952 at Indore, a *proforma* for furnishing information regarding agricultural research stations was circulated to the states. The major portion of the information has been received and will be compiled shortly for publication.

As a result of the recommendation of the Board of Research regarding the proper up-keep and maintenance of genetic material at different research stations, steps were taken to compile a list of the genetic material being maintained at different stations. It is proposed to circulate this list when ready to research workers in the States.

The Advisory Board at its last meeting discussed the problems which might be considered suitable for investigation by the Universities, but felt

that it was not proper to restrict the choice of subjects for investigations by any particular University, since the facilities available at different Universities were not known. However, it was agreed that the Universities might profitably undertake research on problems relating to the undermentioned subjects :

(*a*) Plant nutrition and micro-elements
(*b*) Cytology and cyto-genetics
(*c*) Physiology, cytology and systematics of pathogenic fungi and bacteria
(*d*) Bionomics and biology of insect pests and crop plants and morphology and systematics of insects
(*e*) Role of plant hormones in the growth of crop plants
(*f*) Mechanism of nitrogen fixation
(*g*) Agricultural economics
(*h*) Plant ecology with reference to grasslands and crop plants
(*i*) Morphology and physiology of fishes of commercial importance.

The suggestion was brought to the notice of the Universities through the Inter-University Board, so that the Universities might submit schemes in consultation with and through the state agricultural departments, depending upon the facilities available for investigations on specific problems in the fields indicated above.

Plant introduction

Following the decision of the Board of Research that unco-ordinated import of foreign varieties of plants should be prevented and that all such requests should be centralised through the Council, the State governments, central institutes, commodity research stations, etc., were sending their indents for foreign varieties of plants through the Council. The requests were being compiled with the help of our Missions abroad. The request for material is generally made on a reciprocal basis at governmental level between research stations financed or sponsored by the governments in India and the countries concerned. The Council, in addition was financing a nucleus scheme at the Indian Agricultural Research Institute for plant introduction, where foreign varieties of plants were grown and the promising ones brought to the notice of the research workers in the country. The work was gradually being systematised, but all this was being done at the moment only on a small scale to be expanded later into a full fledged Bureau of Plant Introduction on the lines of the other advanced countries.

Some of the varieties imported from foreign countries during the year 1951-52 are given below :

Materials imported by the Council in 1951-52

Name of the seeds, plants, etc., imported	Variety or strain	Name of the country, from where imported	Name of the State, Research Institute, etc., to whom supplied
Wheat	Austin Quanah Supremo	U.S.A. do. do.	Economic Botanist, U.P., Kanpur

Materials imported by the Council in 1951-52—(contd.)

Name of the seeds plant, etc., imported	Variety or strain	Name of the country, from where imported	Name of the State, Research Institute, etc., to whom supplied
Wheat—*contd.*	Winter wheat/sort Pyselko	Czechoslovakia	Cereal Botanist, Punjab
	Winter wheat/sort Dregerova 12	do.	do.
	Sopu	Helsinki	Indian Agricultural Research Institute, New Delhi
	Hopea	do.	do.
	Olympia	do.	do.
	Touko	do.	do.
	Apu	do.	do.
	Kiuru	do.	do.
Rice	Bengawan	Indonesia	1. Secretary, Kalakshetra, Adyar
	Tjina	do.	2. Director of Agriculture, Madras
			3. Indian Agricultural Research Institute, New Delhi
Barley	Spring barley/sort Proskove's Have pedigree	Czechoslovakia	Cereal Botanist, Punjab
Rye	Onni	Helsinki	Indian Agricultural Research Institute, New Delhi
	Pekkha	do.	
	Toivo	do.	
	Ensi	do.	
	Oiva	do.	
Soyabean	Non-shattering variety	Johannesburg	Institute of Plant Industry, Indore ; Indian Agricultural Research Institute, New Delhi
	Six varieties	Uganda	Director of Agriculture, Mysore
Safflower	. . .	South Africa	Deputy Director of Crop Research, Poona
Lupins	Bitter Blue	do.	Indian Agricultural Research Institute, New Delhi
	Bitter white	do.	
Sunflower	Jupiter	South Africa	Oilseeds Specialist, Coimbatore
	Mars	do.	
	Stripped	do.	
	Polestar	do.	do.
	Sunrise	do.	do.
			do.
Green manuring plants and legumes	Seeds—		
	(i) *Stizolobium aterrimum*	Ceylon	Director of Agriculture, Madras
	(ii) *Sesbania cinerascens*	do.	do.
	(iii) *Desmodium limense*	do.	do.

Materials imported by the Council in 1951-52—(contd.)

Name of the seeds, plants, etc., imported	Variety or strain	Name of the country from where imported	Name of the State, Research Institute, etc., to whom supplied
	(iv) *Aeschynomone american*	Ceylon	Director of Agriculture, Madras
	Plants—		
	(ii) *Phaseolus semierectus*	Indonesia	Central Rice Research Institute, Cuttack
	(ii) *Cassia laschenaultiana*	do.	and Director of Agriculture, Madras
Other miscellaneous seeds	Oysternuts (*Telfaria pedata*)	Rhodesia	Institute of Plant Industry, Indore, Director of Agriculture, Madras and Indian Agricultural Research Institute, New Delhi
Chillies	. . .	Ceylon	Agricultural Research Station, Guntur
		Pakistan	do.
Pepper	. . .	Madras	Agricultural Research Station, Taliparamba, Madras
Santonin	*Artemisia maritima*	Iran	Forest Research Institute, Dehradun
			Chief Conservator of Forests, Madras
Banana	*Musa chilio carpa*	Phillipines	Director of Agriculture, Madras
Sweet Potato	(i) 21 Kyai	British East Africa (Uganda)	Director of Agriculture, Mysore
	(ii) 31 Mulalama	do.	do.
	(iii) 76 Amini	do.	do.
	(iv) 7 Sekalya	do.	do.
	(v) 46	do.	do.
	(vi) 53	do.	do.
	(vii) 19 Kanena	do.	do.
Sweet-Corn	About forty varieties	USA	Cereal Botanist, Punjab

The following is the classified list of plant materials imported during the year 1951-52 (up to 30th June, 1952) by the Director, Indian Agricultural Research Institute, under the Plant Introduction Scheme :

Plant materials imported by the Indian Agricultural Research Institute

Serial No.	Group	Crops	Country of origin	No. of samples
1	Cereals	Wheat, rice, oats, barley, maize, rye	USA, Brazil, Spain, Newzealand, Cyprus, Australia, Germany, Denmark, Turkey, Switzerland, Iran, Italy, South America, Finland, Holland, Indonesia	939
2	Millets	*Sorghum, Panicum miliaceum*	USA, Australia, Iran, Algeria	8

Plant materials imported by the Indian Agricultural Research Institute (contd.)

Serial No.	Group	Crops	Country of origin	No. of samples
3	Pulses	Peas, cowpea, soyabean, ricebean, lentil	USA, Argentina, Cyprus, Australia, Germany, Canada, Ceylon, Indonesia, Finland, Holland	108
4	Oil yielding plants	Sunflower, castor, linseed, groundnut, *Sesamum*	USA, Argentina, Prague, Australia, West Africa, South Africa, Canada, Ceylon, Indonesia, Turkey	29
5	Fibre yielding plants	Jute	Brazil	2
6	Vegetables	Tomato, brinjal, bean, radish	USA, Argentina, Spain, Cyprus, Burma, Australia, South Africa, Japan, Canada, China, Ceylon	97
7	Root and tuber crops	Sweet potato, *Beta species*, (Sugar beet, fodder beet)	USA, Argentina, Australia, Germany	40
8	Legumes	*Crotalaria, Sesbania, Lespedeza, Mucuna, Phaseolus acutifolius, Onobrychis*, lupin, *etc.*	USA, Argentina, England, Burma, Australia, Germany, Canada, Ceylon	70
9	Grasses	*Paspalum*, cocksfoot, timothy	USA, England, Australia, Finland	10
10	Medicinal plants	*Anthemis* sp., *Pyrethrum*, licorice	France, Japan, Iran	18
11	Wild relatives of cultivated plants	Wild relatives of wheat, oats, barley, eggplant, chillies	USA, Argentina, Australia, Iran	18
12	Other miscellaneous plants	*Lythrum, Salicaria* (honey plant), buck wheat, *Chenopodium quina, Kerstingiella geocarpa, Acacia aneura, Prosopis*, Oysternut	USA, Argentina, Canada, Australia, Rhodesia, England	18

Agronomy and Soil Research

Manurial and agronomic trials

This scheme based on the recommendations of Dr Stewart and already sanctioned by the Council for the States of Madras, West Bengal, Bihar, Orissa and Bombay was in progress in the first three States. The results of the Madras and West Bengal schemes are stated below :

Madras Scheme. This scheme commenced on September 19, 1951. It has been established by numerous experiments conducted at various agricultural research stations in Madras that the optimum yield of paddy is obtained

by manuring at the rate of 30 lb. of nitrogen as ammonium sulphate per acre over a basal dressing of 4,000 to 5,000 lb. of green manure or green leaves.

In less than one-fifth of the trials, ammonium sulphate and superphosphate proved superior to ammonium sulphate and superphosphate combination. The reason might have been that the soils under experiments were more deficient in nitrogen than phosphoric acid and the dose of phosphoric acid applied was not sufficient to reflect in increased yield of paddy. Another reason might be the reversion of phosphate to iron and alluminium phosphates in the absence of sufficient lime.

The soils were generally very fertile containing fair amounts of nitrogen, phosphorus and potassium. The nitrogen content varies from 0·05 to 0·07 per cent. in most of the first foot soil samples. The total available phosphoric acid content was not adequate in many of the soils.

The deltaic soil of Tanjore district is mainly clay to loam in the old delta area and the light sandy alkaline soils lie in the higher reaches of the new delta area. The deltaic soil is mainly a heavy clay becoming lighter with depth overlying a bed of sand. *Kankar* is sparse in the old delta area but occurs in elevated regions of the delta. Drainage is generally defective in the district and alkaline patches were noted at many places on the surface in summer in the new area. This is particularly the case in the newer delta area of Pattukottai, Manargudi and Tiruturaipundi *talukas*. In these *talukas* extensive areas of alkaline soils have developed. Near the sea in the old delta in some places the soils are saline.

West Bengal Scheme. The application of ammonium sulphate at 25 lb. nitrogen per acre gave definitely higher yield of grain and straw, while superimposition of superphosphate at 25 lb. phosphoric acid on the same dose of ammonium sulphate resulted in significantly higher yield of straw in only one district. The ammonium sulphate at 25 lb. nitrogen per acre gave an extra yield of approximately three maunds of grain and nine maunds of straw per acre. For 25 lb. of nitrogen per acre we would require roughly $1\frac{1}{2}$ maunds of ammonium sulphate costing approximately Rs. 21. The value of three maunds of grain at the rate of Rs. 8-8-0 per maund and nine maunds of straw at the rate of Rs. 2 per maund work out to Rs. 43-8-0. Making allowance for incidental expenses, net profit obtained from the application of ammonium sulphate might roughly be taken to be Rs. 20 per acre.

Experiments with different types of fertilizers

In pursuance of the Technical Co-operation Programme Agreement, the Government of India were getting the following different kinds of nitrogenous and phosphatic fertilizers :

(*a*) Ammonium sulphate
(*b*) Urea
(*c*) Ammonium nitrate
(*d*) Triple phosphate
(*e*) Nitro-phosphate
(*f*) Ammonium phosphate

A scheme has been drawn up for trials at different centres with these fertilizers to decide their relative superiority under Indian conditions. The trials are of two types, (*a*) storage trials and (*b*) actual trials on cultivators' fields. The former is to be carried out at 20 different godowns representing ports, storage centres, different climatic conditions and agricultural research stations. The fertilizers will be stocked in different types of bags and containers and periodical observations will be taken on temperature, humidity, moisture content, and chemical composition, etc., and a report will be submitted at the end of the year. The trials on the cultivators' fields will be carried out in the Community Project Areas and also out-side such areas.

Trials with Dicalcium and Kotka phosphate. It was observed that the above fertilizers had not yet been tried in India, particularly the citrate soluble superphosphate, which required little or no sulphuric acid in its manufacture. It was therefore decided in consultation with the Director, Indian Agricultural Research Institute to try these fertilizers at the Institute and six other States agricultural centres in Uttar Pradesh, Bombay, Madras, Mysore, Madhya Pradesh and Assam. To start with, it has been arranged to supply half a ton of superphosphate (Kotka) from a manufacturing firm to each experimental centre. The National Chemical Laboratory, Poona has supplied Dicalcium phosphate to Madras and the Indian Agricultural Research Institute. and it is being tried there. Arrangements are being made for the supply of this fertilizer to other centres as well.

Eradication of weeds by the use of chemicals

The synthesis and manufacture of chemicals of the hormone type at the National Chemical Laboratory and actual trials at Madras and Bose Institute were undertaken in connection with eradication of weeds by the use of chemicals towards the close of the year. Three more centres for field work in Madhya Bharat, Bhopal and Himachal Pradesh were sanctioned.

Minor and Trace Elements Scheme (*Indian Agricultural Research Institute*)

This year the scheme yielded some more results of practical importance. The soils at Hosacottay and Coorg were found to be slightly acidic. Texturally the soils of both the areas were sandy clay loam. The soils of the healthy area in Hosacottay as compared to those of the diseased area had higher coarse sand fractions and lower silt contents.

The soil of the diseased area of Jamalpur Fruit Garden (Punjab), as had been reported before, was slightly acidic, whereas that of the healthy area was alkaline. C/N ratio of the soils of both healthy and diseased area in Jamalpur was very low and decreased with depth. In Hosacottay and Coorg C/N ratio of the surface samples of both healthy and diseased areas was very high. This was, perhaps, due to the application of organic manure to the soil. The Nagpur soils were very low in the available phosphate and so were the Coorg soils of the healthy area. The contents of available phosphoric acid in the surface soils of the healthy area were higher compared to those of the diseased area in Nopokulu and Jamalpur, while at Attari and Hosacottay it was found that the diseased soils were higher in the content of phosphoric acid as compared to the healthy samples.

The analyses of the soils of Ubali and Tharsa orchards in Nagpur indicated that calcium content in the soils of Ubali was very high. Phosphate and ferric oxide in the soils of Ubali were much higher than those at Tharsa. Tharsa soils were, however, much richer in potash as compared with the Ubali soils. There was not much difference as regards the total contents of major elements in healthy and diseased soils in Hosacottay.

Base exchange capacity and the exchangeable bases at 0·26 inches depth of the soils of the healthy area in Nopokulu were higher as compared to those in the diseased area. There was no difference with regard to base exchange capacity in the soils of Jamalpur. The soils of the diseased area in Hosacottay generally had a high base exchange capacity and exchangeable calcium. The base exchange capacity of the Nagpur soils was very high.

Analyses of the healthy and diseased samples of Santra and Malta leaves from Jullundur, Attari and Jamalpur in the Punjab indicated that calcium content in healthy samples were higher than that in the diseased ones.

Potash content, in general, was lower in healthy leaves as compared to that in the diseased. In Attari the healthy samples of both *santra* and Malta leaves had higher contents of zinc as compared to the diseased ones, indicating a possible deficiency of zinc. In Jamalpur the healthy sample of Malta leaves had a much higher content of iron than the corresponding diseased ones. Analyses of the leaf samples of Nagpur orchards indicated that they contained a very high percentage of calcium, iron and manganese. Field experiments with fertilizers and sprays were conducted at Coorg sometime back and the trees under these treatments improved considerably.

The scheme outlined above of 'Minor and Trace Elements' terminated on March 31, 1953 and has now been replaced by a co-ordinated scheme for investigations into the micro-element nutrition of citrus trees. The fundamental aspect of the work, *viz.*, micro-element nutrition of plants would be taken up at the Indian Agricultural Research Institute. Work on the nature of the die-back disease of citrus in the Deccan and the Mandarin growing areas in Coorg and Madras would be carried out at the two regional stations to be established in the areas, where this disease was rampant.

Scheme for nitrogen fixation, Indian Agricultural Research Institute

The following conclusions were confirmed :

(i) *Arahar* plants did not bear nodules after a growth of 8 to 12 weeks.

(ii) In the case of *arahar*, manuring with ammonium sulphate at the rate of 40 lb. nitrogen per acre followed by phosphorus at the rate of 120 lb. phosphoric acid per acre gave the best yields.

(iii) Additional nitrogen in *arahar* might come either from the atmosphere or from the deeper soil layers. It was again confirmed that *arahar* was probably endowed with some different sort of mechanism to fix the atmospheric nitrogen in the complete absence of combined nitrogen.

In the case of gram, local and *kabuli*, inoculating the nodule organism in the seed was not so effective, as inoculating the soil preferably with soil from the gram growing area. This was true for gram N.P. 53 and *kabuli* from the

light and heavy soils respectively. Gram N.P. 53 thrived better and gave better nodulation in heavy soils, whereas *kabuli* produced better nodules in light soils.

Out of the wild legume species, *Macunea* sp. gave the most luxuriant growth with broad leaves. It was, therefore, likely to prove good for green manuring and for control of soil erosion. Isolation of the organism from this legume had also been undertaken. The scheme terminated at the Indian Agricultural Research Institute on March 31, 1953.

Scheme on Aztobacter *inoculation of crops in West Bengal*

Experiments were carried out to test the suitability of West Bengal soils for *Azotobacter* growth. One hundred and seven soil samples, collected from different parts were tested for the presence of *Azotobacter* by inoculation of small soil grains in Ashbey's mannite agar plate. *Azotobacter* was present only in 28 soil samples.

Seven soil samples, which did not show *Azotobacter* growth were maintained at 15 per cent moisture with or without the addition of calcium carbonate, potassium hydrophosphate and afterwards tested for the presence of *Azotobacter*. No *Azotobacter* could be detected for 30 days during which the test was carried out.

Except *Azotobacter choococum* and *Azotobacter indicum*, no other nitrogen fixing bacteria were observed on the plates made in the experiments indicated above.

Seeds, soaked with *Azotobacter* suspended in (*a*) water (*b*) soil + 1 per cent mannite (*c*) molasses and (*d*) skimmed milk, were dried in shade and periodically tested for the presence of *Azotobacter*. *Azotobacter* was detected on all the seeds. Growth, however, was quickest in seeds inoculated with water suspension of *Azotobacter*.

The pot culture experiments on the effect of inoculation of jute and *aus* paddy were in progress.

Scheme on the investigation of intestinal pathogens in night soil compost

In response to the recommendations made by the Crops and Soils Wing of the Board of Agriculture at one of its meetings, an examination was thought to be desirable of the night soil compost generally in use for the presence of pathogenic organisms in them and also of the conditions in which such compost might be free from pathogenic organisms and weed seeds. The All India Institute of Hygiene and Public Health submitted a scheme which was approved and sanctioned for a period of one year from April 1, 1953. The object of the scheme was to examine the various samples of night soil compost for helminths (*Ascaris*), trichinae, hookworms, amoebic cysts and bacterial parasites, their behaviour with regard to temperature and other environmental factors, etc.

Soil standardisation studies

A scheme for the standardisation of methods of soil analysis prepared by Shri A. N. Puri, Director, Field Research, Bombay was sanctioned for a period of three years with effect from April 1, 1953. The object of the scheme

is to determine existing methods of soil analysis, selection of those suited to Indian conditions, correlation of the results of soil analysis with crop response and to find out methods of determining integrated quotients of soil fertility and evaluation of limiting factors.

Studies on micro-nutrients, Bombay

Preliminary experiments in some of the States in India have shown the possibilities of increasing the crop yield by the application of small quantities of micro-nutrients like zinc, boron, manganese, etc. The Council, therefore considered it necessary to study the effect of micro-nutrients on major economic crops, more especially the food crops, with a view to augmenting food supplies in the country. In order to carry out the work in a co-ordinated manner, it has been proposed to divide the country into three zones *viz.*, (1) Bombay, Madras, Hyderabad and Madhya Pradesh, (2) Punjab, Rajasthan and other neighbouring States, and (3) Bihar and Uttar Pradesh. The investigations are to be carried out in the Bombay State in the first zone, where preliminary investigations have given promising results. The work will be taken up during 1954-55.

Studies on green manuring

The ' Crops and Soils Wing ' of the Board of Agriculture at its meeting held at Indore in March 1952, recommended that arrangements should be made to obtain and distribute seeds of tropical and sub-tropical leguminous plants and shrubs for trial at different centres in India for ascertaining their suitability for use as green manure. In pursuance of this recommendation the Council look steps to import 48 varieties of such plants from various parts of the world. Some of the seeds are expected in June 1953.

The Council also sanctioned a scheme from April 1953 in Bihar, Uttar Pradesh, Himachal Pradesh, Hyderabad, and at the Central Rice Research Institute and the research station of the Indian Central Jute Committee for testing the utility of the various green manuring crops in the areas concerned both under irrigated and non-irrigated conditions.

Botany and Plant Physiology

Scheme on pre-sowing hardening treatment of crop seeds

The scheme was sanctioned at the Delhi University for a period of two years. It terminated on the 31st March, 1952. The following are the conclusions detailed in the final progress report of the scheme :

(i) Pre-sowing hardening treatment of wheat seeds with distilled water accelerated germination and the rate of seedling growth in the early stages.

(ii) Pre-sowing hardening treatment with 0·1 M solutions of sodium chloride, calcium chloride, potassium nitrate and potassium chloride also hastened germination and accelerated the relative rates of seedling growth.

(iii) Pre-sowing hardening treatments with 0·1 M and 0·05 M solutions of zink chloride, manganese sulphate, copper sulphate and

sodium borate accelerated germinative processes. The relative seedling growth rates in pre-treated plants were greater than that of the control.

(iv) It was observed that pre-treated seeds absorbed greater quantities of moisture from any given humid atmosphere in a given time than control seeds, so much so that the pre-treated seeds germinated one or two days earlier than the control only on moisture available from atmospheric humidity. Experiments on water absorption by pre-treated and control seeds from an atmosphere characterised by low humidity also clearly demonstrated that the pre-treated seeds had better hydrophily.

(v) Amylase activity of pre-treated and control seeds was determined and from the data obtained the rates of hydrolysis of starch were worked out. The results clearly indicated that the enzyme was more active in the pre-treated seeds and its activity increased with the extension of the germination period. Rates of starch hydrolysis during the initial stages of germination were significantly greater in the case of pre-treated seeds. The rates of hydrolysis of starch in the control, however, overtook those of the pre-treated ones after 96 hours of germination.

(iv) Catalase activity of the pre-treated and untreated seeds was also determined and it was observed from the results that both in the endosperm as well as in the embryo, there was enhanced catalase activity in the pre-treated seeds as compared to that of the control in the initial stages of growth. The catalase activity of the control, however, soon overtook that of the pre-treated seeds. The catalase activity in the endosperm continued to increase with time in both the pre-treated and untreated seeds, In the embryo, on the other hand, the catalase activity after showing an initial rise remained more or less at the same level for some time and then registered a fall.

(vii) Reducing sugars were determined in the pre-treated and untreated seeds before and after germination and it was found that in the ungerminated pre-treated seeds the quantity of reducing sugar was less than in the control. On the other hand, the concentration of reducing sugars in all the pre-treated seeds, upto the initial stages of germination, was appreciably greater than that of the control in a comparable stage of germination. This suggested that hydrolytic activity was greater in the pre-treated seeds.

(viii) Sucrose contents of the pre-treated and untreated seeds were also determined and it was noted that the sucrose contents of ungerminated pre-treated seeds was less than that of the control. However, if the sucrose as well as the total sugar concentrations of control and pre-treated seeds, germinated up to the initial stages, were compared, it was found that the sucrose and the total sugar contents of all the pre-treated seeds were higher. This also suggested higher hydrolytic activity in the pre-treated seeds.

(ix) The total quantity of starch in germinated, pre-treated seeds registered a greater fall, as compared with that of the control.

Field experiments in Delhi, Karnal and other places indicated that accelerated germination and increased hydrophily of the pre-treated seeds had an advantage over the untreated ones under *barani* conditions, especially when the moisture content of the soil was low at the time of sowing. In one experiment at the Indian Agricultural Research Institute, where the moisture content of the field was artificially reduced by ploughing and keeping the furrows open, the plots sown with pre-treated seeds gave an increased yield of 25 per cent over that of plots sown with untreated seeds.

In all the experiments at Delhi, where the moisture content of the soil was low at the time of sowing, yield in case of pre-treated seeds was higher than that from the untreated ones. In experimental plots, in which the moisture was at a higher level there was no significant difference between the yields from pre-treated and untreated seeds.

It, therefore, appears that pre-sowing hardening treatment enhances wheat yields under *barani* conditions.

Scheme of research on wheat physiology

The above scheme was sanctioned by the Council from April 1, 1952 for three years at the Delhi University.

The objects were to determine the rates of production and utilisation of regulatory substances in different wheat varieties belonging to different physiological classes; to undertake correlation studies and production of phonocopies in these varieties as well as in varieties of other crop plants; and to investigate the role of enzymic complex and vitamins.

Scheme on the chemical stimulation of ovules

The scheme was sanctioned by the Council for a period of five years from April 1, 1953 under the Head of the Department of Botany, Delhi University. The object of the scheme is to induce haploidy and apomixis in flowering plants by the application of certain chemical agents.

Scheme of research in plant physiology and cytology

This scheme has been in operation at the Vivekanand Laboratory, Almora since October, 1936. This work was to terminate on the 31st March, 1952, but an extension for a period of two years was granted.

Results obtained so far indicate that 12 p.p.m. (part per million) of boron, 75 p.p.m. of manganese, 10 p.p.m. of calcium and 10 p.p.m. of potassium nitrate in the germinating media induced greater elongation of pollen tubes as compared to all the phenoxy compounds or colchicine. The elongation of the tubes of unwashed pollen grains was greater than that of the washed ones, indicating that some stimulating substance or substances existed in the normal pollen grains. In the case of sweet pea pollen M/100 of calcium nitrate (equivalent to 2360 p.p.m.) produced the maximum germination and elongation of pollen tubes, but the same concentration induced inhibiting effect on the elongation of Madonna Lily pollen tubes; on the other hand micro-concentration of 10 p.p.m. had stimulating effect on both.

In the case of potassium nitrate, however, higher concentrations of M/66·6, M/100 and M/133·2 induced inhibiting effect on both sweet pea and Madonna Lily pollen, as evidenced by the fact that the tubes burst soon after germination.

Good germination, however, was obtained in 12·5 per cent sucrose containing 0·5 per cent agar. The lengths of the pollen grains were much shorter being of the order 300 to 400 microns.

Experiments were undertaken to find out suitable culture medium for tissue growth. It was found that White's complete nutrient solution (tissue culture) was the most suitable medium, but the presence of sucrose increased the risk of infection.

It was found that different parts of embryos of mustard T. 102 could be successfully grown in pure G.D.W. for nearly eight days at room temperature ; removal of tip of plumule increased the elongation of the hypocotyl ; several transplants of radicles isolated from embryos could be successfully grown and plumules isolated above the radicles could regenerate roots.

With regard to the effect of chilling and dessicating isolated embryos, it was observed that there was no significant difference in the life cycles of plants from seeds chilled in different solutions except in the case of potassium nitrate, where significant earliness of 3·8 days was observed. In the case of the controls, the life cycles of plants from seeds soaked in 2, 4-D, OGPPA and Colchicine were significantly shorter by nearly two weeks.

Vernalisation response of 37 strains of wheat was observed. Two new strains, Atlas 50 and 66 gave the best vernalisation response. Atlas 66 gave an earliness of about 20 days. These strains were found to be free from rust, although the incidence of rust was heavy.

Insect Pests and Plant Diseases

Insect pests

Tests with DDT and other allied insecticides were continued at the Indian Agricultural Research Institute, New Delhi and in Uttar Pradesh and Bombay.

Trials conducted at the Indian Agricultural Research Institute with emulsions of DDT, BHC, Aldrin, Dieldrin, Chlordane and Parathion in different strengths against *Tribolium castaneum* (adults) as the test insect tentatively showed that the toxicity of these insecticides was highest with Parathion and decreasing in order with Aldrin, Dieldrin, BHC, DDT, Chlordane.

In another set of spraying trials, emulsions of DDT and BHC and suspension of Toxaphene were used in different strengths against *Euproctis lunata* (larvae) as the test insect. The results achieved tentatively indicated that suspension of Toxaphene was better than emulsions of DDT or BHC of the same strength so far as toxicity of these insecticides was concerned.

Persistence of insecticides under natural conditions

Spraying done with emulsions of DDT, BHC, Aldrin, Parathion, Chlordane and Dieldrin in different strengths on castor showed the persistence of DDT (1 and 2 per cent) for as much as 41 days with *Euproctis* as the test insect. The effects of Aldrin and BHC (both 0·5 per cent) were lost after 14 days and that of Parathion (0·125 per cent) within seven days.

With locust hoppers as the test insect, the effects of Dieldrin spraying (0·25 per cent and 0·125 per cent) were in evidence up to about one month.

Phytotoxicity of the modern insecticides

Spraying was done with emulsions of DDT (1 and 2 per cent), BHC (0·5 and 0·25 per cent), Aldrin (0·5 and 0·25 per cent), Dieldrin (0·25 and 0·125 per cent), Chlordane (0·25 and 0·125 per cent) and Parathion (0·0625, 0·0015, 0·003 and 0·125 per cent) on castor, maize and berseem. Observations recorded on berseem showed that about 7 and 10 per cent of the leaves were burnt by 1 and 2 per cent DDT respectively; about 7 and 25 per cent of the leaves were damaged by BHC 0·25 and 0·5 per cent respectively; and Parathion (0·0625 per cent) produced only slight damage to the crop. So far as maize was concerned about 4-5 per cent and 5-7 per cent of the leaves were damaged by 1 and 2 per cent DDT respectively. No phytotoxicity was observed with the remaining of the insecticides on any of crops. Also no phytotoxicity was observed when emulsions of the first three insecticides were sprayed on cotton and sugarcane.

Effect of modern insecticides on viability

Preliminary observations on the treatment of *moong* (I.C. 682) and cowpeas (E.C. 455) seeds with 10 per cent DDT dust (commercial) showed that germination of these seeds after the normal storage period was as satisfactory as the control.

Control of some common insect pests

Mango hopper control (*Bombay*). Insecticides tried were Chlordane 5 per cent plus sulphur, Toxaphene 5 per cent plus sulphur and DDT 5 per cent plus sulphur in equal amounts. Toxaphene plus sulphur gave 96·1 per cent decline in the population against 89·4 per cent with DDT *plus* sulphur and 71·5 per cent with Chlordane plus sulphur.

Fly breeding control (*Bombay*). The water wettable formulations tried were DDT, BHC and Toxaphene of 1 per cent, 2 per cent and 3 per cent strengths each. BHC and Toxaphene in all strengths gave satisfactory results of nearly 100 per cent kill, while 3 per cent DDT gave a maximum kill of 50 per cent.

Singhara beetle (Galerucella birmanica *Jac.*) *in Uttar Pradesh*. The trial was carried out with (*a*) five per cent BHC dust (5 per cent Hexyclan) at 20 lb. per acre, (*b*) tobacco dust and (*c*) Pyrodust 4,000 (a proprietary insecticide containing pyrethrin), each at 40 lb. per acre against the adult, larval and pupal stages of the *singhara* beetles in a tank at Uttripura (Kanpur) during November. All the treatments remained effective up to 15 days. The insecticides under trial had no effect on pupae.

Red pumpkin beetle (Aulacophora foveicollis *Lucas*) *in Uttar Pradesh*. Dusting with 5 per cent DDT at weekly intervals proved to be the best.

Mango mealy bug. 'Ekatox 20' (a proprietary insecticide containing 20 per cent Parathion) was found to be very effective against the mango mealy bug.

Insect pests of stored cereals (Punjab). At the rate of 0·15 to 0·3 per cent by weight of grain in earthen vessels, Hexidole 805 (0·15 per cent and 0·2 per cent), D. 024 (0·15 per cent and 0·2 per cent), Geigy 33 (0·2 per cent), Toxaphene (0·3 per cent), and Agrosan (0·3 per cent) completely checked the multiplication of the pest, *Trogoderma granarium* Everts. Other dusts, *viz.* G-205-P (0·2 per cent and 0·3 per cent) and Agrosan (0·2 per cent) also proved quite satisfactory. The germination of the treated grain remained practically unaffected, being 94·6 to 98·2 per cent as against 98·6 per cent in the control.

All the chemical dusts mentioned in the preceding experiment along with D. 025 (5 per cent BHC) were also tried against *Rhizopertha dominica.* F. Hexidole 805 (0·15 and 0·2 per cent), D.O.24 (0·15 and 0·2 per cent), D. 0·25 (0·3 per cent), Geigy 33 (0·15 per cent), Toxaphene (0·3 per cent) and Agrosan (0·2 and 0·3 per cent) proved effective in completely checking the multiplication of the pest. G-205-P (0·2 and 0·3 per cent) and Geigy 33 (0·2 per cent) were practically as good as the others.

Dusts of the leaves of *kaner* (*Narium odorum*), *ak* (*Calotropis procera*), *bhang* (*Cannabis sativa*), *dharek* (*Melia azedareh*), *hermal* (*Peganum hermala*), *kikar* (*Acacia arabica*), *dhatura* (*Datura alba*), *aksan* (*Withania somnifera*), *neem* (*Melia indica*) *and Eucalyptus* were tried against *Trogoderma granarium* Everts, and *Rhizopertha dominica* F. at the rate of 4-6 per cent. The results were not encouraging.

Waxy tarpaulin and tarpaulin of Vynide (supplied by the Imperial Chemical Industries Limited, Kanpur) were tried as covers for fumigating stocks in the open. The results obtained were erratic.

Methyl bromide. It was tried in a *pucca* godown at Nurpur at the rate of 1 lb. per 1,000 cubic feet of space, the exposure being 12 hours. Wheat was stored in bulk and the temperature of the godown was raised from 58-63°F. to 62-77°F. by heating the room with *angithi* before fumigation. Cent per cent mortality was obtained, the insects being *Tribolium castaneum* Hbst. *Laemophloeus sp.* and *Sitophilus oryza* L.

Ethylene dichloride and carbon tetrachloride mixture. Trials were conducted in *pucca* godowns with reduced dose, *i.e.*,10 lb. per 1,000 cubic feet and increased exposures of 50 hours, 70 hours, 72 hours and 75 hours during the active season and 80 hours during winter were conducted. Cent per cent mortality of *Sitophilus oryza L.*, *Rhizopertha dominica F.* and *Tribolium castaneum Hbst.* was obtained with all the exposures during the active season, whereas in the case of *Trogoderma granarium* Everts, the effect was practically nil. The temperature during the periods of exposure varied from 76-104°F. During winter, however, when the temperature was only 57° to 63°F., the mortality was 57 per cent, 100 per cent, 83 per cent and 33 per cent respectively. This also emphasised the importance of temperature as a factor affecting the efficacy of a fumigant. Ethylene dichloride and carbon tetrachloride mixture was also tried in mud bins at the rate of 20 lb. per 1,000 cubic feet and with exposures of 48 hours, 72 hours, and 168 hours. Practically cent per cent mortality of the adults of *Tribolium castaneum* Hbst., *Sitophilus oryza* L. and *Rhizopertha dominica* F. was obtained at different depths of the bins. In case of the grubs of *Trogoderma granarium* Everts, mortality varied from

13 to 100 per cent. In case of small gunny bags observations made indicated that the activity of the insects *Rhizopertha dominica* F. and *Tribolium castaneum* Hbst. was comparatively restricted in bags immersed with 5 per cent DDT suspension.

Persistant toxicity of BHC and DDT films on different kinds of surfaces. (i) *BHC films.* The potentiality of BHC solution, suspension and emulsion is practically the same on the treated surface. The mortality of *Rhizopertha dominica F., Trogoderma granarium* Everts and *Sitophilus oryza* L. was over 50 per cent on almost all surfaces after 130 days of treatment. The treated surfaces gave over 70 per cent mortality of *Tribolium castaneum* upto 120 days of treatment and the mortality came down to 30 per cent on some surfaces like *pucca* brick, white washed *kothi* and *theka* after an interval of 10 days. (ii) *DDT films.* The surfaces treated with DDT suspension and emulsion gave 100 per cent mortality at the age of 300 days in the case of *Rhizopertha dominica F., Sitophilus oryza L.* and *Trogoderma granarium* Everts. The mortality of *Rhizopertha dominica F., Sitophilus oryza L.* and *Trogoderma granarium* Everts on surfaces treated with different formulations of DDT solution ranged from 50 to 100 per cent during a period of 300 days. A considerable variation was observed in the mortality of *Tribolium castaneum* on surfaces treated with different formulations of DDT. The mortality ranged from 70 to 100 per cent falling sometime as low as 36 per cent. On the other hand, surfaces treated with DDT solution generally gave a mortality of 60 to 100 per cent but the lowest figure recorded in this connection was 26 per cent.

Schools of research in entomology and mycology

The following schools of research in entomology and mycology were continued during the year :

Entomology—White flies (Punjab), Jassidae (Plant Protection Advisor), Ichneumidae (Indian Agricultural Research Institute), Chrysomelidae (Kanpur, Uttar Pradesh) and Chalcidoidae (St. John's College, Agra).

Mycology—Physiology of parasitism (Indian Agricultural Research Institute) and Bacterial diseases (Bombay).

Scheme for research on synthetic insecticides, Punjab

A chart showing the places of growth of the different plants suspected to possess insecticidal properties in the Kangra and Kulu valleys was compiled.

Toxicity of *dharek* fruits in different fomulations like dust decoction and extracts with solvents was found to be due to a mixture of alkaloids present in the fruits. With *ak* and *dandathohar* the mortality in insects, against which these were tried, seemed to be due to the presence of some resins in the latex of these plants. In the case of *harmal* fruits and *satyanasi* leaves the toxicity seemed to be due to the alkaloids and glucosides respectively present in them. Mortality with *dharek* fruit dust was probably due to its contact effect. Mortality with other treatments, however, was due to starvation only. *Dharek* fruits dust proved quite effective against aphis infesting gourd. With *satyanasi* oil, a concentration of 0·4 per cent gave 100 per cent mortality, whereas with lower concentration the mortality declined appreciably. Mortality rates of 95 per cent and 91·7 per cent were obtained with

the alcoholic extracts of the latex of *danda thohar* and *ak* respectively as compared to 96·6 per cent with Agrocide (0·1 per cent) kept as standard and without any Agrocide as control.

Plant virus

The scheme at Delhi and Simla Centres started functioning with effect from May 31, 1952. The administrative control of the Poona centre of the scheme was transferred to the Head of the Division of Mycology, I.A.R.I., with effect from August 20, 1952. The results of work carried out at Poona are indicated below :

(i) Dolichos *enation mosaic.* Experiments on cross protection in White Burley tobacco with the *Dolichos* enation mosaic virus and tobacco mosaic virus were further carried out. The results obtained provide conclusive evidence to show that protection to tobacco plants was not afforded by the *Dolichos* enation mosaic virus against infection by the tobacco mosaic virus.

(ii) Datura *mosaic virus.* Electrophoretic studies carried out on the purified *Datura* mosaic virus protein in a Tiselius apparatus over a *p*H range of 5·5 to 7·6 showed that the virus protein moved with a single sharp boundary proving thereby that the virus preparation was electrophoretically homogeneous.

(iii) *Mosaic of* Carica papaya. The host range of the virus was studied further. None of the plants inoculated except *Impatiens balsamina, Tropaeolum majus* and *Helianthus annuus* were infected and from none of them the virus could be recovered.

In experiments on transmission of the virus by *Myzus persicae* and *Aphis gossypii*, it was observed that the percentage infection increased with increase in the number of insects and that *M. persicae* was found to be a more effcient vector than *A. gossypii.* The virus was of the non-persistent type since the vector did not carry the infection beyond the first plant. Nymphs of *M. persicae* did not transmit the virus.

(iv) *Mosaic of* Cucurbita moschata. The virus did not infect tobacco and *Datura inoxia* inactivated at a dilution of 1 in 5,000 and after storage for three days at the laboratory temperature.

(v) *Yellow vein mosaic of pumpkin.* The virus causing yellow vein mosaic of pumpkin was discovered in Poona in 1951, characterised by the typical yellow vein symptoms and dwarfing of pumpkin. The virus was not found to be sap-transmissible, but was readily transmitted by the white fly, *Bemisia tabaci.*

(vi) *Mosaic disease of brinjal.* The virus infected *Nicotiana tabacum* and *Datura inoxia* was completely inactivated at a dilution of 1 in 1,000 and after storage for three days. The virus which was sap transmissible was also transmitted by *Myzus persicae.*

(vii) *'Katte' disease of cardamom.* An unidentified host plant of the black banana aphis, the vector of the virus, was discovered.

(viii) '*Small leaf*' *disease of cotton.* Experiments on the disease reaction and varietal susceptibility of cotton varieties were carried. Two varieties of the New World and five of the Old World types of cotton were infected by graft inoculation.

Rice

The Rice Research Scheme, Jammu and Kashmir State

The American, Australian, Italian and Japanese varieties are about a fortnight late in maturing than the Chinese varieties, but are getting popular because of good yields (3,200 lb. to 3,540 lb. per acre). The Chinese varieties, which have been fully acclimatised, have now replaced most of the local varieties and have yielded 60 per cent or more over the other imported and indigenous varieties.

Some of the Russian and American varieties have proved very early maturing and are harvested about six weeks earlier than indigenous varieties. There are great possibilities of these varieties being grown at high altitudes, where no cereals except low yielding small millets and buck wheat are grown at present.

China 1,039, China 989, China 972 and China 1,007 gave 105·59, 35·56 16·79 and 16·0 per cent more yields respectively than Begum, a local variety.

Inorganic manures did not prove economically profitable due to the rise in the price of ammonium sulphate, but a mixture of organic with inorganic manure gave a higher net profit of Rs. 108-5-0 per acre than ammonium sulphate or F.Y.M., which gave net profits of Rs. 79-8-0 and Rs. 84-9-0 respectively.

Application of F.Y.M. at 150 lb. of nitrogen per acre gave 28·78 and 46·32 per cent higher yields and higher net profits of Rs. 50-10-0 and Rs. 105 per acre than the minimum dose of 60 lb. of nitrogen per acre and control respectively.

Lentil ploughed under, as green manure, with application of superphosphate to lentil crop and lentil without superphosphate application ploughed under as green manure gave 72·76 per cent more yields respectively than the control.

Paddy after fallow gave 7·57 per cent more yield than paddy after oilseed crop. The broadcast method of sowing, which is the usual custom in the Kashmir valley gave 6·4 per cent more yield than the transplantation method.

Rice Breeding Scheme, Coorg

From the varieties introduced previously, six Mysore varieties, nine Madras varieties and nine Bombay varieties were found to be promising and so they were put under comparative yield trial.

Out of 133 varieties (local as well as outside) 100 varieties gave the maximum yield of 3,226 lb. per acre. Out of these 100 varieties, 33 were local.

Rice Breeding Scheme, Nawagam

Selections S.K. 20, S.K. 26, S.K. 10, L.St. 71, E.St. 39, E.St. 38, L.St. 67, J. 278, P. 203, of different varieties maintained their significant superiority in yield. Basmati Miroli, a local sample received from a progressive cultivator, had fine and long grains.

Agronomic experiment on spacing-cum-number of seedlings per bunch confirmed that closer the spacing, the less would be the number of seedlings and wider the spacing, the more would be the number of seedlings required per bunch.

Rice Breedng Scheme, Bulsar

The promising selections from the three varieties *viz.*, Kada, Wankvel and Early Kolam were tried on a large scale along with their local checks on randomised block design. In the Kada variety, five selections out of nine proved significantly superior to local Kada giving 6 to 13 per cent higher yields, but only three proved significantly superior to the other check, Kada 68-1 giving 2 to 9 per cent higher yields. The results of Wankvel variety indicated that all the selections were significantly superior to Ziniya 31, but not to the local. Out of four selections tried, three out-yielded the local, Early Kolam giving 27 to 34 per cent higher yield.

Twenty nine selections of the cross Kada 68-1 × Basmati 370 and 40F_4 selections of the cross Ziniya 31 × Ambemohor 39 were tried with their parents. All the 19 cultures of the former cross were found to be significantly superior to the either parent.

Hyderabad Rice Improvement Scheme, Warangal

On the basis of yields, 140 primary selections were made from among the 34 high yielding new acquisitions. The period of maturity of the selections varied from 173 to 190 days. The per plant yields varied from 10 to 29 grammes except that of 400-8, which yielded nine grammes. H.R. 38 had the highest mean yield of 2,434 lb. per acre. The local yielded 2,254 lb. per acre and stood fourth in order of merit. The ratio test with short duration strain H.R. 19 conducted in *abi*, indicated that the highest level of nitrogen, *i.e.* 30 lb. per acre in combination with 16 lb. of phosphoric acid per acre, in the ratio 1 : ½, gave the maximum yield.

The ratio test with the same strain (H.R. 19), conducted in *tabi* indicated that the best results were obtained with 60 lb. N in combination with phosphoric acid in different ratios. The ratios themselves were not consistent. The present recommendation of the Department is 30 lb. of nitrogen +15 lb. of phosphoric acid.

A basal dose of green manure with 7½ lb. of phosphoric acid and 45 lb. of nitrogen +22½ lb. phosphoric acid per acre gave the maximum yield of 3,250 lb. per acre. Green manure responded best with nitrogen and phosphorus at levels higher than 15 lb. of nitrogen +7½ lb. of phosphoric acid.

Rice Breeding Scheme, Punjab

Under small scale variety yield tests, eight varieties, *viz.*, ADL-4, N-136, Chalaka, ABD-4, Bhutmuri, N.22, Jhona 314 and CO.13 gave about 60 per cent more yields than their standards. Under large scale trials Toga 28 in Begam Narot Group, N.P. 125 in Palman group and S. 20 in J.K.W. group outyielded their respective standards with significant margins. From yield data it seemed that early and medium varieties of 110 to 130 days duration were suitable for the Punjab.

The application of superphosphate alone or in combination with nitrogen gave lower yield than the control. The yield of paddy increased progressively as the dose of nitrogen was increased. Eighty pounds of nitrogen gave 51·15 per cent higher yield than the control. It was confirmed that 349 Jhona (course) responded to manuring better than fine variety Basmati 376.

There was a definite trend of increase in yield with closer planting of seedlings. It was observed that it was immaterial to give any spacing in the early plantings, but when late sowing became inevitable, close spacing (6 in. × 6 in.) was distinctly advantageous. The seed rate of 2 *chattaks* per *marla* (1/60 acres) gave the highest paddy yield per acre. In regard to the age of seedlings, 6 weeks old seedlings gave the highest yield of 11·57 maunds of paddy per acre.

In regard to interaction between spacings and number of seedlings per hole, 6 in. × 6 in. spacing with three seedlings per hole gave the highest paddy yield per acre.

Paddy Improvement Scheme, Kalimpong

In a varietal trial consisting of six varieties of autumn paddy, local Resemba stood first in order of merit giving a yield of 1,669·75 lb. per acre. It appeared that this variety contained valuable genes.

It appeared from the observation that a Chinese type No. *C.N.A.B.4* and three locals, *viz.*, Sujai, Nagadham and Krishnabhog, proved to be very early and vigorous with fairly high yields among winter paddy.

It was observed that the highest yield was obtained by Jasuda when transplanted with three seedlings per hole, Timbure and Chirakay with four seedlings and Tauli with one seedling per hole. It, therefore, appeared that different varieties responded differently to different treatments.

It was observed that Rushylate with high dose of nitrogen as ammonium sulphate at an early stage, and a low dose just before flowering, China 1,040 with no ammonium sulphate at an early stage and a low dose just before flowering and Mansarah with a low dose at an early stage and a high dose just before flowering, gave nearly two, three and four times greater yields respectively than that of the respective controls.

Scheme for research to evolve better varieties of boro *paddy in West Bengal*

At none of the places, the difference in grain yields among the varieties and in the control was found to be statistically significant, although Bhutmuri at Chinsurah and Satui, Dhaival at Baidyabati and the local Bhogjira at Ghatal topped the list in order of merit.

As regards straw yield Bhutmuri at Chinsurah, Assam I at Satui and Baidyabati and local Bhogjira at Ghatal appeared to be the best although, the results were not statistically significant. Orissa Kakuria gave the highest yield. The experiment was statistically significant as regards grain yield at the Chinsurah Farm. So far as straw was concerned, local gave the highest yield. The experiment at Ghatal was statistically significant regarding straw yield.

Scheme for hybridization between japonica *and* indica *rices*

The programme involved crossing of 32 *indica* parents received from various States to six *japonica* parents at the Central Rice Reserch Institute, Cuttack. During the period under review, a total of 70,915 crosses were made and 11,783 hybrid seeds obtained. Out of a total of 192 cross combinations proposed, 112 combinations were completed.

Scheme of research for investigation of blast and foot-rot diseases of rice in Madras

The blast disease caused by *Piricularia oryzae* has a wide distribution in the State. It attacks the crop in all stages of growth. In the early stages some measure of control is effected by the application of fungicides. In later stages of the crop, especially when the crop is in ears, fungicidal treatments were not found useful.

Two disease resistant strains, Co. 25 and Co. 26 possessing capacity for high yields and suitable for places, where long duration varieties could be grown, were released.

Application of heavy doses of nitrogen in any form resulted in increased incidence of disease in susceptible varieties. Under the conditions of the experiments in Coimbatore, 20 lb. of nitrogen either in the form of ammonium sulphate or groundnut cake over a basal dressing of 5,000 lb. of green leaves appeared to be the safety limit in respect of a highly susceptible variety like Adt. 10. In the case of Co. 4, Co. 25, and Co. 26, application of as high a dose as 120 lb. of nitrogen over 5,000 lb. of green manure, did not result in increased incidence of disease to any appreciable degree. This finding is of importance in that it indicates the need for growing disease resistant varieties at places where increased production is sought by the application of high doses of nitrogenous manures, especially in localities where the disease is known to be prevalent.

The experiments also showed that the application of phosphoric acid and potash had no balancing influence in counteracting the effect produced by the application of heavy doses of nitrogenous manures.

A number of grasses growing on the bunds of paddy fields were found to be collateral hosts of the fungi and of these *Panicum repens* was found to be the most widely distributed and probably was mainly responsible for carrying over the disease from one season to another in the absence of the rice crop.

The foot-rot disease of rice was found to be mainly seed borne. Complete control of the disease was effected by seed treatment with the following organo-mercury fungicides :

Margamma, Agrosan G. N., Certosan, Ceresan (Tillantin R.), Agrosan 4, Ceresan (Japan)

Scheme for investigation on insect pests of paddy in West Bengal

Paddy Stem borer (Schoenobius incertellus *Wlk.*). It was found that the maximum temperature of the previous day, the minimum temperature of the night and the humidity at the time of putting out of light were positively

correlated with the activity of *S. incertellus*. This insect was found to be more active during the first half of the night than in the latter half. It was further observed that during the full moon week, the catch of this insect appreciably decreased, as compared to the catch in the dark nights.

As a result of the varietal resistance study it was concluded that paddy stem-borer caused more damage to the medium type *aman* paddy than the fine and scented type of *aman* paddy.

Rice Hispa (Hispa armigera *Ol.*). It was seen that the weather conditions were directly correlated with the activity of this insect. The fluctuation in weather conditions changed the normal activity of this insect. Rainfall had an adverse effect on the population of this insect and its activity decreased after the rainfall.

It was also seen that the intensity of damage by the insect varied with the age of the crop. In the seedling stage the damage was 2·5 per cent; in the transplanted paddy (one week after transplantation) the damage was 4·5 per cent; in the flowering stage of the crop the damage was 0·8 per cent; and in the ripe stage of the crop the damage was nil.

In consideration of the residual effect, its rapidity of action, the absence of phytocidal effect and its low cost, BHC stood first with DDT next as an insecticide against this insect.

Scheme for the investigation of Helminthosporium *disease of paddy in West Bengal.*

It is a well known fact that air-borne conidia of *Helminthosporium oryzae* Breda de Haan is capable of bringing about new infection.

It was observed that the leaves were more susceptible to attack of the pathogen in the earlier stages, when the plants were two to three weeks old.

Results of inoculation experiments indicated that infection in the flowering stage was heavy and resulted in a high percentage of sterility of grains.

Investigations indicated that the fungus *Helminthosporium oryzae* did not remain in the soil, but its presence was observed in large number of samples of stubbles.

There was little difference in stand in different types of soil, but leaf infection was highest in inoculated soil.

Examination of the different soil samples showed that the presence of the fungus could be detected in case of inoculation by both fungal culture and stubble in sterilized soil. These findings indicated that the fungus was capable of withstanding summer heat, but not under conditions of competition with other micro-organisms.

Field observations on the relative susceptibility or resistance among local varieties to the disease indicated that none of the varieties were resistant to infection. The fine varieties showed comparatively less infection and were moderately resistant to attack. When the plants were transplanted, grain infection appeared to be less.

In *bad* land (high land) and in *kanali* land (medium land) leaf infection was low in plants grown under high manurial conditions. Infection (both leaf and grain) was high under high level of nitrogenous fertilizers. Combination of phosphatic fertilizers with nitrogenous fertilizers at high level

tried to lower infection, particularly grain infection. Application of fungicides tended to lower the leaf infection in the initial stages and spraying was more effective than dusting.

Trials at Chinsurah showed that both spraying and dusting were useful in lowering the infection appreciably in the early stages and all the applications resulted in increase of yield both of grain and straw over the control. Another interesting feature noted was that dusting resulted in an increase of weight of straw.

Application of ammonium sulphate to paddy lands of West Bengal

Ammonium sulphate increased the yield of both grain and straw at the farms in Chinsura and Suri, and its effect had been positive at Berhampore farm, where F.Y.M. appeared to increase the yield of grain and straw slightly. In the case of grain, no better results were obtained by increasing the doses beyond 30 lb. nitrogen per acre ; in case of straw, higher doses gave higher yields. Bone-meal produced slight increase in the yield of grain and straws, but it failed to do so at Berhampore farm. Lime also appeared to slightly increase the yield of grain, but it failed to show any effect on the yield of straw at Suri farm.

Wheat and Barley

Wheat Rust Control Scheme

The co-ordinated Wheat Rust Control Scheme was in progress at most of the centres during the year as shown below :

Botanical : Delhi, Simla, Pusa, Indore, Powerkhera (M.P.), and Parbhani in Hyderabad (Deccan). (Niphad, Kanpur and Gurdaspur centres are expected to start functioning from 1-4-53.)

Testing Work : Mahabaleswar (Bombay). (Selections from Bombay, Madhya Pradesh and Hyderabad were tested here for resistance in the seedling and adult stages.)

The work now covers practically the entire wheat area of the country. For each area varieties resistant or partially resistant to one or other of the three forms of rust are available for general cultivation, but as yet no variety has been found, which is resistant to all the forms of rust. The aim of the scheme is to breed varieties, suitable to the different areas. The results reported from the different centres are given below.

Botanical Work

Delhi. The exotic variety E.931 was found to be highly resistant to seven races of black rust. Among the Indian varieties, the Kenphad wheats showed high resistance to some of the individual races of black rust. Among allied genera, *Agropyron desertorum* showed complete resistance to black rust.

The exotic wheats E.928, 931, 938 and 957 were found to be highly resistant to individual races of brown rust. Af. 31-1 (*T. persicum*), E.337 (*T. durum*), E.930 (*T. durum*) and E.952 (Rio Negro), etc., were highly resistant to a mixture of all the races of brown rust. Among the allied genera tested against a mixture of all the races of brown rust, rye tetraploid, Australian rye, Russian rye and Assam rye showed high degree of resistance.

E. 740 (*T. dicoccum*) showed complete freedom from yellow rust, while E.924 and E.938 showed high resistance. Among Indian varieties, C.224 and C.228 showed high resistance to a mixture of all the races of yellow rust. I.C.834 (*T. dicoccum*) showed a fair degree of resistance to all the three rusts—black, brown and yellow.

Out of the 42 recently received exotic varieties, 12 showed high resistance to black rust, about 24 showed freedom from brown rust, and 37 showed complete freedom from yellow rust. Eleven varieties exhibited either high resistance to or complete freedom from all the three rusts.

Five hundred and seventy two cultures received from U. S. A. were artificially infected in the adult stage with a mixture of all the races of the three rusts. Of these 123 varieties were found to be resistant to black rust, 293 to brown rust and 382 to yellow rust and 82 were found to be resistant to all the three rusts, simultaneously.

The hybrid strains found highly resistant to all the individual races of black rust in the seedling stages, were W.206 pl. no. 9 and 40. S.128, S.81 and S.51 showed resistance to black and yellow rusts. S.294 of cross W.375 showed a high degree of resistance to all the three rusts.

Simla. Two Afghan wheats, *viz.*, E.731 and E.906 were found to be quite desirable as regards yield and resistance to rusts.

Of the exotic varieties tested only one (E.31), four (E.931, E.928, E.938 and E.957) and one (E.740) were found resistant to all the races of black, brown and yellow rusts, respectively. E.931 was resistant to all the races of black and brown rusts, both in the seedling and adult plant stages.

Hybrids W.375/S.128, W.375/S.81 and W.375/S.51 were simultaneously resistant to all the races of black and yellow rusts.

W.7/S.25, W.206/S.77, W. 206/S.88, W.246/S.155 and W.246/S.157, etc., were tested in the regional varietal trials at different hill stations in the country and were found to be highly rust resistant.

The strains W.292/S.713, W.292/S.717, W.292/S.703, W.311/S.739, W.311/S.751 b, W.312/S.762 and W.329/S.784 gave a very desirable account of their performance, both as regards yield and rust resistance. In W.292 material, rust resistance and yield were successfully combined with exceptionally good quality of grain.

All the progenies of crosses W.292, W.312 and W.329 were seen to be completely free from any rust attack. Strains W.375/S.95, W.375/S.181 and W.375/S.129 out-yielded both the improved varieties, *viz*, Ridley and N.P. 770.

In the two yield trials, Ridley topped the list in both the tests. N.P.770 was second in one test. Both the varieties had very attractive grains and were very resistant. W.246/S.157 showed complete freedom from all rusts.

In N.P. varietal trial N.P.728 was observed to be a very promising variety outyielding all the remaining. In the trial with early maturing varieties W.375/S.199 and S.13 were found to be good yielders and rust resistant.

In the sowing date-cum-varietal trial, it was found that there was discernible interaction of these two factors at Simla, where the growing period

for the wheat crop was rather long. It was noticed that late maturing varieties were suitable for earlier sowing, *i.e.*, in September or during early October.

Strain R.R.88 contributed a high degree of resistance against black rust to the F_1 plants. Similarly E.957 contributed a high degree of resistance to the F_1 plants against brown rust.

Forty-six selections made in the F_3 generation of the cross Gabo × N. P.52 were tested for their resistance to the three rusts. Three of these selections appeared to be promising and were homozygous for agronomical characters and reaction to rusts. They appeared to be highly resistant to black rust.

Strains RR. 105 and 134 gave the highest yields ; strains RR. 77, 79, 88, 89, 100, 106 and 134 were almost free from the attack of black rust in the trial of strains resistant to rusts.

In a small scale trial of some rust resistant strains, N.P.761 and hybrid 5-7-2 gave the highest yield (1873 lb. per acre).

Indore. The following varieties were found good in tillering :

T. durum : E.885, G.D.11, B.14, Malwi local, Motia, Baxi local Baxi 133 and Jaya.

T. vulgare : N.P.710, 737, 760, 764 and 775, M.E.43, Pb.C.280, 281 C. 253 and C.228, Kenphad no. 21, 25 and 28, Niphad 4, Powerkhera hybrids 5-7-2 and 12-5-3 and Alapur no. 6 from Madhya Bharat.

In the trials with rust resistant strains, N.P.710 was the highest yielder (16·60 md. per acre), W.206/77 following it closely.

Powerkhera. Seeds of the rust resistant hybrids were multiplied over an area of 430 acres on different Government farms of the State. Seeds sufficient for 450 acres were available for further multiplication. Out of the four Italian strains Funo, Impeto, Fiorello and Rictill, the last two did not ear at all. The other two resembled A.090 in growth period. The Cyprus strain named Yiannaki was of *durum* species and later in maturity than the local *durum* strains. Its yield performance was poor.

From the crosses in generations F_5 and F_6, those with N.P.114-3-2 as one of the parents yielded many promising progenies vigorous in growth and possessing an impressive ear type. From the resistant families of crosses in F_7, F_8 and F_9 generations, new selections were made from the point of view of evenness in growth, maturity, etc.

The yield trials of the new rust-resistant hybrids were carried at ten State farms as well as on the cultivators' fields. The following hybrids gave equal or higher outturn than the controls : 38-9, 8-13-1, 18-5-7, 19(1-3), 3-6-4, 12-5-3, 11-1, 11-2-6, 277-1, 12, 65-4, 172-2, 11-8, 5-7-2 and 11-6.

The last seven hybrids were tried successfully on the fields of the cultivators also. Promising results were obtained in generations F_6 and F_5 in respect of rust resistance. Out of 560 and 214 progenies tested, 453 and 169 progenies respectively were found to breed true for rust resistance. The number of successful bulks were seven and eight out of 19 and 16 tested in generations F_6 and F_5.

In all, 21 hybrids were grown for seed multiplication over an aggregate area of 430 acres, which produced 2,500 md. of seed. The results regarding the performance of the hybrids 65-4 (early ripening) were encouraging on cultivators' fields. Hybrids 65-4 and 5-7-2 did well also on those farms, where wheat was taken as a second crop after the harvest of paddy.

Out of 32 *vulgare* progenies carried forward for a larger trial during the year, eight were found to be significantly superior to control A.090 and 20 to the second control A.115 at 5 per cent level.

The Advisory Board recommended that the parents like A. 013, A.090 and A.115 should be exploited for back crossing to further improve the yield of hybrids on the lines of the technique followed by Briggs in California. This done.

Mahabaleshwar. Strain 88 remained free from infection in the seedling and mature plant stages and 1.36.32.13.1.2 maintained its moderate resistance. Six varieties of wheat from Kenya maintained their resistance even at high temperatures.

Of the 52 Mexican varieties of wheat retained last year for further study, 32 were early maturing as well as resistant to rust under field conditions of infection. Only nine varieties proved resistant in the seedling stage at low and high temperatures.

Of the 219 wheat varieties (mostly exotics) maintained at the Central Breeding Station at Niphad, only one, *viz.*, Frondson K.G.9906 was free from infection in the field till harvest. This variety was, however, moderately susceptible to races 21 and A in the seedling stage. Kenya C.10854, E.148 Kenya Sabanero and Egypt N.A. 95 exhibited considerable field resistance.

Out of 827 individual plant selections from the Central Breeding Station, Niphad, under the test consisting of crosses between Gaza (rust-resistant) and the improved wheat varieties of the *durum* group grown in Bombay State, selections from the following crosses, which were in F_3 and F_4, yielded promising rust-resistant plants: Gaza x Jaya, Gaza x Baxi 23, Gaza x Baxi 26 and Gaza x Baxi 288-18.

Rust-resistant strains from the cross (Kenya E.144 x Niphad 4) were now being released for distribution under the name 'Kenphad'. Even when sown late, these strains developed only 5-10 per cent infection as a result of rise in air temperature during the grain filling period; Niphad 4 had 65 per cent infection, when grown side by side with this.

Madhya Pradesh. Out of 1246 selections from different wheat crosses that were tested, the following crosses in F_3 yielded rust resistant and agronomically promising selections. Hy 65-5 x Hy 278-4-1-1, (N.P. 52 x EX. 30) x Hy 5-3, Hy 65-5 x Hy 278-4-1-4, Gaza x H.116 and its reciprocal and Gaza x A.090.

Of the 174 selections which proved homozygous for rust resistance in F_5, 158 belonging to crosses of N.P.114-3-2 with exotic varieties deserve special mention because of the impressive growth of the plants and compact earheads in addition to resistance to rust. A large number of selections from the following crosses proved homozygous for rust resistance consecutively for at least two years:

E.B. 74 x Ex. 73(C.14112), E.B.76 x Ex.73, N.P.114-3-2 x Ex. 11(60 B.12B-16L), N.P. 101 x Ex. 11 and Ex. 11 x N.P. 101.

Of the progeny of 39 hybrids comprising five crosses in F_3 and F_4 tested at Indore Station, eight from the cross N.24 x E.145 proved homozygous for rust resistance, although not very promising for growth and earhead characters.

Mycological Work at Delhi and Simla

Study of physiological races. In all, 127 collections (104 from wheat, 10 from barley, 5 from oats and 8 from grasses) were analysed from 1950-51 and 1951-52 crops. Yellow rust of wheat was found in two grass rust collections from New Delhi and black rust of oat in six grass rust collections from Madras State. Races 21 and 42 of black rust, race 20 of brown rust and 19 of A of yellow rust of wheat were found to be widely distributed throughout the country. Only five races of black rust of wheat previously reported, *viz.*, 21, 42, 40, 34 and 24 (in order of prevalence) were met with. Races A and B, which had sporadic appearance in 1945 and which were occasionally met with in subsequent years were not found. Races 75 and 15 first reported as early as 1931 and 1934 respectively were also not found. Race 34 seemed to have become common and was found on both wheat and barley (reported from Himachal Pradesh, and Hyderabad-Deccan). Race 24 was met with in collections from Delhi, Uttar Pradesh and Hyderabad (Dn.).

All the eight races of brown rust of wheat previously reported were found, race 20 predominating. Next was race 63 in order of prevalence. Race 107 seemed to have distribution in Madras and Travancore. Only five races of yellow rust previously reported, *viz.*, 19,A,D, G and E (in order of prevalence) were found in the collections of 1950-51 crop, studied in the winter of 1951-52, race 19 comprising the bulk. Race 19 was obtained in the collections of grasses, *Bromus japonicus* and *Bromus catharticus* and wild barley, *Hordeum murinum* from Indian Agricultural Research Institute, New Delhi.

Only two races of black rust of oat, previously reported, *viz.*, 4 and 6 were met with in collections from Madras and Travancore-Cochin. These two races were found to occur also in collections of *Vulpia myurus* and *Briza minor*, the two common grasses growing in the hilly tracts of Madras (Nilgiris).

Search for rusts on collateral hosts. Bromus catharticus, Bromus japonicus and wild barley, *Hordeum murinum* from Delhi (Indian Agricultural Research Institute) were found infected in nature with *Puccinia glumarum.* Race 19 was identified on all of them.

Two grasses, *viz.*, *Vulpia myurus* and *Briza minor* heavily infected with races 4 and 6 of *Puccinia graminis* f. *avenae* were received from Madras for identification. They appeared to be collateral host of the black rust of oat.

Thirty one species of improved grasses were tested in seedling stage against mixtures of races of black, brown and yellow rusts of wheat and black rust of oat and nine of them were found to be susceptible or semi-resistant to *Puccinia graminis tritici*, 14 to *Puccinia graminis avenae* ; three to *Puccinia triticina* and 12 to *Puccinia glumarum.* The rest were either resistant or showed very weak infection.

Besides regular artificial tests rust observations were made on 18,940 plants of wheat and barley, which were naturally infected in fields adjoining the Wheat Breeding Sub-station at Simla.

Seedlings numbering 8,676 and 22,473 adult plants of wheat crosses and their progeny, wheat varieties and allied genera were tested for rust resistance. Also 339 plants of barley varieties were tested in the seedling stage and 390 in the adult stage.

Millets

Jowar. In the scheme for the breeding of *jowar* varieties resistant to the parasitic weed *Striga* in operation at different stations in Madras (Lam, Hegari, Nandyal and Coimbatore), 18 selections at Lam and four at Hagari, which proved promising, were retained for further trials. At Nandyal out of the 17 selections made, two (As. 8194/1 and As. 8196/4) were found to be no better than As. 4003 in *Striga* resistance. On the other hand, in trials with five Periamanjal cholam selections at Coimbatore, Co. 11 showed low percentage of *Striga* infection. Promising results were obtained in the experiments on hybridization. Eleven crossed heads in G_1 and G_2 with As. 4003 were sown at Lam. All the F_1 showed no *Striga* attack. Nine selections, which were derivatives of crosses of (Co. x 1 As. 4003) x Co.1 were tested at Coimbatore. All of them were found to be superior to Co.1 and equivalent to As.4003, as regards their *Striga* resistance character.

The object of the scheme in Saurashtra State was to increase the production of *bajra* and *jowar* crops by the evolution of high yielding types suitable to different soils and climatic regions of the State by the introduction of improved varieties, individual plant selection, in-breeding and hybridization and selection from subsequent generations. 203 F_4 selections of crosses between Hegari (American) and local types were grown. Due to scanty rainfall only the F_4 early selections and a few mid-late selections could set seeds. Some promising individual plants from these were earmarked for further study by plant to row method.

Bajra (*cumbu*) (*Pennisetum typhoides*). The Hybrid Cumbu Scheme, Madras aimed at the evolution of high yielding hybrids of *bajra*, production of hybrid seed on a large scale, and distribution of this seed for large scale cultivation in order to increase the outturn from this millet. Yield trials conducted with seven short duration hybrids in the irrigated and rainfed seasons showed that in summer under irrigation two short duration hybrids (H.866 and H.865) gave significantly higher yields than the standard Co.3. One hybrid of short duration (H.854) was found to be superior to the standard with a 11 per cent increase in grain yield in the monsoon season. Five hybrids of medium duration were tested in the rainfed season and all of them proved significantly superior to the standard in the yield of grain, the percentage of increase varying from 33 to 70 in the case of the different hybrids.

These hybrids were tested in the fields of the cultivators. In North Visakhapatanam, X_1 and X_2 were found to be higher yielding than the local varieties, which were of the same duration. The average increase in yield was 17 per cent in the case of X_1 and 18 per cent in respect of X_2. Similarly at

Coimbatore, as in the previous year, there was considerable increase in grain yield, over-ranging 38 per cent in the case of X_1 and 47 per cent in respect of X_2 at different centres.

Sawan (*Panicum crusgalli*). At Kanpur the strains T.33 and T.46 gave higher yields, *i.e.*, 796·5 lb. per acre and 767·7 lb. per acre respectively. On the whole the work on *sawan* produced two outstanding strains, *viz.*, types 25 and 46. They looked identical and gave similar yields, although the former seemed to have done somewhat better at Gorakhpur and the latter at Kanpur. Under favourable conditions Kanpur T.46 gave a yield of about 2,000 lb. per acre, which was indeed a very high yield to be expected from a crop of the short duration of ten weeks.

Kodon (*Paspalum scrobiculatum*). The strain 15A/1 gave significantly higher yield (1052.2 lb. per acre) than the local (837·5 lb. per acre) at Gorakhpur. Similarly, at Kanpur the strain 14B/1 gave the highest yield (994 lb. per acre) and strain 8A/1 closely followed it, giving a yield of 673 lb. per acre.

In the agronomic experiments regarding the control of *Striga* in Jowar *Striga* Scheme at Coimbatore (Madras), the yield data and *Striga* incidence in the plots sown with '*cholam*' indicated that there was no significant difference in the incidence of *Sriga* due to the effect of deep summer cultivation. On the other hand, at Nandyal significant difference was observed in the incidence of *Striga* attack as compared to the normal cultivation plots. In trap-cropping at Coimbatore and Nandyal (with two trap crops raised this year), the incidence of *Striga* was significantly less in both these cases, when compared with the control. In trial of weedicides at Coimbatore, preliminary studies were made in spraying *Iso-propyl-N phenyl-Carbamate* on *Striga* in different doses. It was found to have no effect on *Striga* plants. An experiment at Kanpur to find out the most suitable date of sowing *sawan*, showed that the third week of June was the best. Type 46 in second sowing, *i.e.*, on June 20 gave 24 maunds per acre and took less than 2½ months to ripen. This yield was considered very high for such a short duration crop.

Mixed cropping. At Tarikhet centre in U. P., the mixture *mandua*(*ragi*), *gahat* (horse gram) yielded highest (758·2 lb. per acre) and *mandua*, soyabean closely followed it (645·6 lb. per acre).

Maize

Scheme for the improvement of maize crop

Indian Agricultural Research Institute, New Delhi. Forty-two Indian and foreign open-pollinated varieties were tested in a yield trial. The results indicated that differences in maturity existed among the varieties listed, as was shown by the fact that the number of days for silking ranged from 48 in Golden Bianty and Granoturco da Semma, an Italian variety to 64 in P6.T.43. A variety from Indore State gave the highest yield (3251·54 lb. per acre).

In another trial except a few varieties, *viz.*, Giddu Gonjal (Duddangi), G.G. (Arbhavi) and G.G. (Kalloli), which were fairly early, the rest matured at about the same time as Pusa Yellow (2) in 59 days. As regards yield, Kanpur type 41 excelled with 3,226.67 lb. per acre.

In a third trial a variety from Rajasthan, Basi selection proved to be promising as an early and high yielding variety.

It was observed that on an average the sibbed lines were late and had longer cobs.

The results of a trial with a number of single crosses brought out two broad facts (*a*) that in general crosses among inbreds derived from the same variety were inferior in yield to crosses between lines derived from different varieties and (*b*) that the performance of inbred lines in top crosses was an indication of their performance in single crosses.

Twelve of the U. S. hybrids were listed in trials at Jullundur, Mangwal, Nagrota, Himayatsagar and Malakmer. Dixie 11 was among the top five in six trials, Dixie 22 in 10 trials, Texas 26 in nine trials, Dixie 33 in six trials, and N.C. 27, U. S. 13 and Indiana 416 B in three trials each. Five Canadian and four Australian hybrid seeds were tried at seven centres. In general, the Australian hybrids yielded better than the small Canadian hybrids.

Punjab. Tasseling period and cob circumference appeared to be simple characters as 79·17 per cent and 90 per cent of the inbreds attained the desired amount of homozygosity in the former character in the very first and third generation and the latter character attained homozygosity to the desired extent in the first generation and maintained steady progress in the subsequent selfing generations. Other characters like plant height, cob length, 100-kernel weight, grain-yield per plant appeared to be complex, as only 9 and 2 per cent inbreds attained homozygosity in the first two characters and the last one respectively in the first generation; further progress was however not maintained.

The examination of yellow inbreds revealed that some of them had reached the stage of reasonable purity in respect of almost all the plant characters after the second and third, fifth and seventh generations of inbreeding.

The majority of the crosses which gave higher yields than the standard were the cross combinations of Kashmir 2-2A-7-2, N.W.F.P.12-2 B-18-9, Punjab 68-2-2-1 and 69-2-2-1. Trials with these inbreds in the 'top crosses, also showed that they were good combinations.

Ten exotic hybrids proved superior to even the best local at Jullundur by a margin ranging from 1·46 to 56·43 per cent and one of them, *viz.*, Q.716 did so by a significant margin. Australian hybrids, on the whole, did well but they were late in maturity and might not fit in properly in the cropping scheme.

The performance of exotic hybrids in the lower hills at Mangwal and Nagrota was disappointing. At Katrain 25 exotic hybrids out of 30 proved superior to local by a margin ranging from 3·45 to 108·9 per cent and 17 of them did so by a significant margin. Q.739 continued to give good performance.

The development of corn hybrids is a long time process. To cut this short, the possibility of growing on extra crop of maize in the hills during spring months was explored. As a result of experiments carried out in the past at Nagrota, it was fully established that good maize crop was possible in the hills.

Uttar Pradesh. Inbreeding was repeated in the originally selected 32 varieties of 1949 and 78 varieties of 1950 for raising S_1 lines. In all about 520 S_1 cobs were retained for further inbreeding. Inbreeding was repeated

in all the S_1 lines of the last year. In all 155 S_2 cobs were retained for raising S_3 lines. Inbreeding was continued in 84 S_2 lines of last year. Only 62 S_3 lines could be retained for raising S_4 lines next year. In all over 1,500 plants were selfed in various inbred lines and cultures which gave 955 selfed cobs.

The trial with imported double hybrid U.S. 13 was repeated at Kalianpur against U. P. types and Kalianpur local. All the U. P. selections outyielded U. S. 13 and Kalianpur local, the yield difference being significant.

Double hybrids Iowa 306, U.S. 13 and V.L.5 supplied by Shri Boshi Sen were tested against V.P. type 41, Farrukhabad and Kalianpur local. V.L. 5 and Farrukhabad local yielded significantly higher than U.S. 13, T 41 K. local and Iowa 306.

Thirty-six double hybrids imported from U. S. A. and sent by the Head of the Division of Botany, Indian Agricultural Research Institute, were tested against T. 41 and five locals of U.P. and laid out at four centres, *viz.*, Baharich Kalianpur, Almora and Bulandshahr. The imported hybrids, *viz.*, Texas 26 Dixie 33, Indiana 620 C, and others gave higher yields than T. 41 and the locals at the first three stations, while at Bulandshahr the yields in general were very poor.

Another set of imported hybrids, four Australian and three Canadian also received from New Delhi were tested against T.41 and six locals of U. P. at the four centres mentioned above. At Bahraich, the two locals from Jaunpur and T.41 outyielded the Australian and Canadian hybrids significantly. At Kalianpur, Q.431 gave slightly higher yields than the locals and T.41. At Almora, the yield differences were not significant, though Almora local, T.41, Kalianpur local and Bahraich local outyielded all the hybrids. At Bulandshahr, the trial failed completely.

A trial with F_1 and F_2 seeds of U.S. 13 and Min. 404 against T.41 and Kalianpur local was repeated to see how far the original vigour of the F hybrids passed in the F_2 generation. Curiously enough this year again Min 404 (F_2) outyielded the F_1 seed of Min. 404, the yield differences being significant.

To test the decline in vigour and yield of S_1 and S_2 against their open pollinated types, a trial of five varieties was laid out. The open pollinated of all the types except 4,111 yielded higher than their S_1 and S_2, though even here the yield differences were not significant. S_1 of all the types except T.19 yielded higher than their respective S_2, though the yield differences between S_1 and S_2 of T.19 were not significant.

Another trial of three hybrids from U. S. A., *viz.* V.8, U.65, and V.72 against T.41, 4,111, and Kalianpur local was laid out at Kalianpur. U.65, U.72, and 4,111 yielded higher than V.8, T.41 and K. local.

Shri Boshi Sen had sent smaller samples of 20 types of maize evolved at Vivekananda Laboratory for trial against U. P. types at Kalianpur. As compared to T.41 varieties V.L.D.63, V.L.T.1, V.L.T.5, V.L.D.38, V.L.T.7 gave significantly higher yields, whereas V.L.D.36, V.L.D.60 and Kalianpur local gave significantly lower yields. Other varieties proved to be of the same rank.

To study the effect of seed treatment with fungicides before sowing maize on its yield, a trial was laid out using three varieties treated with three fungicides. Un-treated seeds of all the varieties were used as controls. The treated seeds of all the varieties gave higher yields than the un-treated (control) ones. Among the varieties T.41 and 4,111 yielded significantly higher than the Kalianpur local.

Bihar. The first experimental crop was sown in October, 1951 and harvesting was done in the third week of January. The seed setting was perfect.

It appeared that maize could be grown in this locality during winter months. if irrigational facilities were available. Summer was quite favourable for maize, and the second crop was sown. The third sowing which was done in the second week of July, 1952 also succeeded.

Inheritance studies were made of the following plant characters : (*a*) barren stalk, (*b*) tassel ears, (*c*) branched ears, (*d*) reaction of stem borers and (*e*) leaf roller.

Hyderabad. The following hybrids gave a uniformally consistent performance in different hybrid tests : N.C.27, India 416 B, Wisconsin 622, Iowa 4316, Wisconsin 595, Dixie 11, Dixie 18, Ohio M. 34, U. S. hybrid 13, Texas 26, Dixie 22, U. S. hybrid 523, Dixie 33, Ohio 92, Indiana 419A, Georgia 281, Indiana 620C Iowa 4412, Wisconsin 341A.

Rajasthan. Trials with some American hybrids showed that some of them gave higher yields, but they were either too early or very late. The late varieties were not suited to Rajasthan conditions.

Punjab. The hybrids imported from America were tried and some of them gave higher yields. The hybrids have again been imported for trials during the second year before final selections are made.

West Bengal. Pop, Flint and Dent types of maize are commonly found in the Darjeeling district. In all, 163 types of maize were collected and grown for study.

Inbreeding of 18 types was in progress. Out of 36 U. S. A. hybrids received from the Indian Agricultural Research Institute, Dixie 18 again outyielded all the other varieties. A new varietal trial with 12 U. S. A. hybrids at Haringhata farm did not give satisfactory results. Also five Canadian and four Australian hybrids from the Indian Agricultural Research Institute were not successful.

Out of 10 U. S. A. and four South African types of sweet corn received through the Indian Agricultural Research Institute and Mr. C. H. Johan, Madras, respectively, U. S. A. types failed to germinate. The South African types grew very well ; one type particularly gave four tillers per plant with a single cob in each.

Production of hybrid maize, Almora. This scheme is in operation since 1951. Nearly 100 md. of hybrid maize U.S. 13 were produced in 1951 and about 60 md. in 1952. The entire quantity was taken over by the Department of Agriculture, Uttar Pradesh for trials in Government farms and cultivators' fields. The results of the first year's trials are awaited. The seed was also being tried in the Punjab and Himachal Pradesh in the hilly areas and by private individuals at different places in India.

Pulses

The co-ordinated scheme for pulse research carried out in different parts of the country was in operation during the year in Madras, Uttar Pradesh, Hyderabad, Madhya Bharat, Bengal and Orissa. Some of the important results of the investigations are summarised below.

Botanical

Bengal gram (Cicer arietinum). In Uttar Pradesh, type 87 continued to be the best yielder ; no other variety gave significantly higher yields, though some of the new selections appeared to be good for breeding purposes due to their earliness and high yields. Some hybrids from crosses of type 87 and the Banda Variety of Bundhelkhand, which were in the seventh generation appeared to be the only material, which might compete with type 87 in efficiency and even excel it : one of these, *viz.*, no. 251 was an early variety.

Red gram (Cajanus cajan). Investigations in Madras State produced some high yielding strains of red gram. At Coimbatore type 37 consistently yielded about 10 md. of grain per acre, which was about 20 per cent more than the standard during the last two years. This variety proved to be best at Dharmapuri also, where it yielded 25 per cent more grain than the local varieties. Trials under *ryots* conditions during the last two years in various centres in the southern districts of State also proved its superiority over the local types. This will now be issued as an approved strain with the station number. Similarly, at Vizianagram two improved types of red gram, medium maturing no. 72 and long duration no. 97 yielded 25 and 12 per cent respectively, more than the locals in separate trials.

In Orissa, trials at Bargarh indicated that three strains, *viz.*, no. 22, 40 and 64 might be promising.

In Uttar Pradesh, two early strains no. 5002 and 4903 (now called type 1 and type 2 respectively), were selected as the best of red gram varieties suitable for those areas of western districts which demanded an early type to escape the damage from frost in January. These new strains were ready for harvest by the beginning of December, and thus escaped the onslaught of severe cold weather. Cultivation of these two types might also make *arhar-sugarcane* rotation profitable. The medium strains, on the other hand were ready for harvest by the last week of February or early part of March, while the late cultures matured by the end of March. Late strains, however, generally yielded higher than the earlier ones. At Kanpur, 4002/3A, and 4121/5A appeared to be better than type 17 which has been recommended at present.

Yield trials to discover high yielding strains were conducted at different farms in West Bengal, such as Berhampore, Chinsurah, and Midnapore. The results indicated that no. 7 and 10 were the best at the Berhampore farm and no. 22 and 7 at the Chinsurah farm.

Investigations in Madhya Bharat revealed that Ambah 3 at Gwalior and C. F. Ujjain at Ujjain were the best yielders during the current year.

Black gram (Phaseolus mungo *L.*). Investigations in Madras State brought out some high yielding strains of black gram. As in the previous year no. 212 and 216 proved outstanding in yields at Coimbatore, giving almost double the yield of the local. The yield had been further stepped up

to 163 and 122 per cent over the locals during the current year. In trials in the cultivators' fields also no. 212 retained its superiority giving on an average of 15 per cent more yield than the local variety used by the *ryots*. Likewise at the Vizianagram station culture no. 189 maintained its superiority over the locals on the dry lands by yielding 60 per cent more grain than the local. It was now being multiplied for general distribution to the *ryots*.

In Orissa, selection no. 1601 recorded the highest yield at Athargarh, followed by local types 2 and 1, the first two giving 66 and 36 per cent more yield than the local varieties generally grown by the *ryots*. All the three were also found superior to the N. P. types. In another trial also the superiority of the new selections over the N. P. types was established. Some of the new selections such as S.144 and S.95 also outyielded the N.P. types by about 154 and 114 per cent more than the local mixtures. Similarly, at Bargarh selection 462 has been found to be consistently outstanding, yielding about 60 per cent. over the local .Here again some of the new selections (like no. 443 and no. 626) showed promise of good performance.

In Uttar Pradesh, the early strains of black gram flowered as early as *mung* type 1, but were not so early in maturity, which started about 10 weeks after sowing. Among these early strains type 9 (4406-3) from Bareilly was selected for multiplication. Some other promising early strains are 3, 5 and 7. Among the most promising late strains were type 47(4417-9) and type 49(4418-6). Type 49 was selected to replace the old recommended variety (type 27). In Madhya Bharat, Sheopur 17 and Jora 4 were found to be significantly better than the locals at Gwalior and Ujjain centres respectively.

Green gram (Phaseolus aureus). In Madras State at Coimbatore, no. 62 was consistently the best in yield for the last three years. During the last two years it yielded about 30 and 35 per cent. more than the local variety. Trials under cultivators' conditions in the subsequent year showed that it gave an average of 12·5 per cent and 15-20 per cent more yield respectively than the local varieties. At *Rabi* Pulse Research Station, Athagarh, Orissa, selection 150 gave the highest yield followed by no. 28, both giving 140 and 114 per cent more yield respectively than the local. Among the new selections no. 1934 gave good results. Similarly, at *Kharif* Pulse Research Station, Bargarh, no. 676 was found to be significantly the best.

In Madhya Bharat, Krishna 11 and Jagudan 17 significantly outyielded the locals at Gwalior and Ujjain respectively.

In Uttar Pradesh, selections of *mung* type 1, were examined for uniform maturity and one of the selections T.1/12 seemed to be promising.

In West Bengal, mung type 1 received from U. P. was found to be very early maturing in about two months time ; a minimum of three crops could thus be raised in a year from the same land.

Fodder trials with the three exotic types E.C. 988 (*Phaseolus reccardinaus* Brazil), E.C. 968 (*P. aureus* Brazil) and E.C.776 (*P. calcaratus* Burma) at different times of sowings showed that these were *kharif* types and due to the excessive vegetative growth, they could very well be recommended for growing as fodder in Bengal.

Horse gram (Dolichos biflorous). In Madras State, at Coimbatore no. 35 yielded twice of D.B.7. At Dharmapuri two new selections 122 and 123

gave significantly higher yields (100 and 52·5 per cent more respectively) than the local variety. No. 76 and 93 were sent from Vizianagaram for trial under cultivators' conditions. The black seeded 93 gave higher yields than the locals at all the places to the extent of 10-32 per cent.

In Orissa, two strains (no. 39 and 164) were found to be outstanding at Athargarh. A new selection (S.164) was also significantly superior, yielding about 11½ md. per acre or over 1½ times of the local. Similarly, at Bargarha three strains (no. 40, 47 and 143) seemed to be useful, as they yielded 30 per cent more than the local. In Hyderabad scheme at Warangal, some three strains, *viz.*, 33, 34 and 42 proved promising.

Field bean (Dolichos lablab). At Coimbatore, the black seeded no. 1458 gave double the yields of buff seeded D.L.231 and white seeded D.L.173. Similarly, no. 44 was found to be significantly better than the local at Dharmapuri with 45 per cent more yield.

Moth *bean* (Phaseolus aconitifolius). *Moth* type 4301-12 was found to be the best at Kanpur, while at Attara 4312 and 4313 gave very promising results.

Lentil (Ervum lens). Type 36 was found to be promising in Uttar Pradesh for late paddy rotations. Another strain type 3 was also found suitable due to its earliness and yield. In Bengal C.T.31 was significantly the best among the strains tried.

Peas (Pisum sativum and P. arvense). Among the peas variety T.163 was consistently the best in yield in trials in Uttar Pradesh. It did well even when sown as late as early December. It is a medium maturing type of good yielding capacity. It can be grown even after cotton as a very late *kharif* crop.

Soyabean (Glycine hispida). To evolve suitable early strains for soya-bean wheat rotations in the hills in the Uttar Pradesh, investigations were started at Tarikhet. One of the medium early selections T.63 was selected for the purpose. Though it had larger and more attractive seed, as compared to the local varieties and yielded higher, it was not early. A search for a still earlier strain to meet the demands of the growers to fit in the rotation with wheat was still in progress.

Agronomical

Some interesting and useful results relating to mixed cropping, rotation, time of sowing and such other cropping practices were obtained. These are briefly mentioned below:

Mixed cropping. With the object of finding out the cereals and other crops, with which pulses could be grown as economic mixtures, two sets of mixed cropping trials (one for the south west monsoon season and the other for the north east monsoon season) were started in 1946-47 at Coimbatore, Dharmapuri and Vizianagaram in Madras State. In the second set of experiments (comprising black gram, green gram, horsegram, *tenai* and cotton), black gram grown in mixture with cotton was found to give the highest monetary return per acre at Coimbatore. At Vizianagaram the last four years' results had indicated that crops such as *cumbu* or *ragi* followed by the pulse (horse gram) gave the maximum return. On the otherhand, the current

year's results indicated that a pure crop of groundnut followed by horse gram gave the highest monetary return per acre.

In Orissa, as a result of investigations during the last three years, it was concluded that mixed cropping of *beali* paddy (very early autumn short-duration type) and black gram gave the highest monetary return and hence was much more paying than cultivating pure paddy or black gram alone.

At Gwalior in Madhya Bharat, mixed cropping (with *jowar*, *arhar* and *mung* in the proportion 96 : 1 : 3) gave the highest monetary return of Rs. 67 per acre against Rs. 57 of control (pure *jowar*). But the differences were not significant. On the other hand, at the Ujjain centre, the mixture (64 : 9 : 27) gave the best return of Rs. 64 per acre against Rs. 57 from pure *jowar*.

Rotations. In Uttar Pradesh, most fields of late paddy are at present left fallow after the crop is harvested at the end of November or early December, when it is too late to take a *rabi* crop. In investigations for discovering a suitable pulse variety for rotation with late paddy, type 87 gram variety was found to be the best. Pea type 163, a very late *kharif* season crop did well even if sown as late as early December, and could be grown even after cotton.

Time of sowing. In Bengal an experiment was performed to find out the optimum period for sowing *arhar*. It was found that sowing from May 10 to June 9 was favourable under West Bengal conditions.

Pathological

In the Punjab, before regular investigations on gram wilt were taken up at Ferozepore, a *Fusarium sp.* was considered to be responsible for the wilting and death of the gram plants. However, the research work revealed that the disease, as it occured in the Punjab State, was of non-biological origin and was caused by (*a*) high temperature at the time of sowing, (*b*) deficient soil moisture, (*c*) general stiffness of the soil or the presence of a calcareous or clayey hard pan and (*d*) the concentration of harmful salts in the soil. Of all the cultural operations tried during the past years, including the year under report to control the disease, subsoiling was found to be very effective not only in reducing the amount of wilt to negligible proportions, but also in increasing the grain yield.

As to the method of subsoiling, the surface soil was stirred with the country plough after about a couple of inches of rain during the monsoon. Then with a ridger attached to a horse-hoe, a ditch about 6 inches deep was made and in this ditch a furrow turning plough (like the Raja plough or Hindustan plough) was used to dig the soil to a further depth of 6-7 inches. The ridger and the inverting plough were worked simultaneously, the latter following the former.

The best time for sowing gram in the main gram growing tract of the Punjab State was found to be the period covered by the second and third week of October.

Gram is mostly a rainfed crop. But, where irrigation was available, one irrigation of about three inches during the early stages of the growth of

the crop (November or December) was found to be most beneficial. Combined with the optimum date of sowing and other measures mentioned below it gave excellent results.

The measures devised to control wilt disease effectively, as also to enhance grain yield of the gram crop, could be summed up as follows :

(i) Subsoiling upto a depth of one foot
(ii) Elimination of weeds
(iii) Production of loose mulch (about 3 inches thick) immediately after the cessation of the monsoon rains by a cultivator followed by planking and bar harrowing
(iv) Use of gram variety suited to the tract
(v) Sowing gram crop during the second and the third week of October.

Developmental

Side by side with the evolution of suitable crop varieties to meet the demands of the farmers, arrangements were also made by State Governments to distribute the same. In Madras State, improved types of red gram varieties such as type 37 from Dharmapuri and types 37 and 2900 from Coimbatore were multiplied and distributed to the *ryots*. Similarly, in Bengal gram types 7, 10 and 32 were released to the cultivators.

In green gram, two types were released from the Madras State, no. 62 from Coimbatore for general cultivation in the southern districts and no. 127 from Vizianagaram. In Orissa, the high yielding no. 150 was released to the cultivators from Athargarh. Type 1 *mung* had been spreading rapidly in Uttar Pradesh ; it had now been passed on to Bengal as a promising pulse, which could be cropped even three times in a year from the same piece of land.

Similarly, in black gram also some high yielding varieties were selected for the benefit of the farmers, *viz.*, no. 89 from Vizianagaram and no. 1601 from Athargarh (Orissa). In Uttar Pradesh, early type 9 from Bareilly and late type 49 were selected for multiplication and distribution ; the latter is expected to replace the existing departmental variety type 27.

In *moth* also an improved variety (4301-12) was released from Kanpur, and distributed to the farmers.

Fruits

Mango

At the Fruit Research Station, Saharanpur, Uttar Pradesh five plants were successfully raised from the seeds imported from Indonesia.

The varieties growing at the research station and in the neighbouring localities were classified on the basis of girth, height and spread, as follows :

(*a*) Dwarf
(*b*) Semi-vigorous
(*c*) Vigorous.

A number of chemicals were tried for deblossoming mango inflorescence. Six, eight and ten per cent. solutions of oviciole proved effective and deblossoming was achieved without damage to foliage.

At the Hyderabad Research Station, hybridisation between North and South Indian varieties was conducted to evolve suitable hybrids with good characters. The period of flowering in the varieties was observed, and the maximum range of flowering noted was 92, 93 and 90 days in Mulgoa Desi, Mulgoa Black and Amini respectively.

Citrus

In Madhya Pradesh, Assam, Orissa, the Punjab, Hyderabad and Uttar Pradesh various research schemes with a view to finding out the best varieties and suitable scionic combinations were in progress.

In Madhya Pradesh sour orange and sweet lime retained higher percentage of fruits followed by Rangpur lime. The average differences between individual stock and scion girths except in case of Rangpur lime continued to widen. The height and spread of trees were less as compared to those in the last year.

In Assam five local root-stocks, *viz.*, Rabab tenga, Soh-myndong, Pani jamir, Karun jamir, Satkora were bundled with Khasi mandarin orange. It was found that there was no significant difference among the scions on the root stock of Karun jamir, Soh-myndong and Rabab tenga.

In regard to yield the scion trees on Soh-myndong recorded the highest yield, *i.e.*, 290 fruits per tree, while those on Pani jamir produced the lowest, *i.e.*, 144 fruits per tree. Generally speaking, trees yielding more fruits seemed to have dropped more than the low yielding ones.

Banana

With a view to effect all round improvement of banana by introducing better varieties and evolving better cultural practices, experiments were conducted at the Central Banana Research Station at Aduthurai in Madras and at two sub-stations, one in Bombay and the other in Bengal.

At the Banana Research Station, Aduthurai, one hundred and fifty three varieties were collected from different parts of the State and outside for trial and at the Bengal Banana Research Station, 124 varieties were collected and planted for study. Similarly, collection of 52 banana varieties was made at the Bombay Banana Research Station, out of which three have flowered so far.

Grape Vine

With a view to bring together quality and yield, 14 sets of crosses were made at the Fruit Research Station, Hyderabad, out of which 140 fruits matured to produce seed. Ten varieties of grape vine were observed to resist powdery and downy mildew.

Guava

At the Fruit Research Station, Saharanpur, air-layering by the new soil and waterless method proved successful and might provide root stock at a

low cost. Hybridisation was also done to introduce seedlessness in Allahabadi guava.

Papaya

At Fruit Research Station, Saharanpur 200 varieties were collected and line breeding was in progress to maintain the best types from them. Two types of seeds were also imported from Brazil.

A new chemical method of processing papaya was developed, which gave a high quality product.

Fruit preservation

Schemes on fruit and vegetable preservation were in progress in the States of Assam and Bihar. The aim of these schemes was to train persons especially ladies in the art of preserving fruits. In Assam three different courses, an advanced course of nine months, a short course of three months and a ladies' course of 15 days were organised.

In Bihar 49 candidates, out of which 35 were female, successfully completed a 15 days course arranged at four centres.

Description of varieties of fruits grown in India

Work on the description of two hundred and fifty varieties of mangoes grown in India was completed and a monograph prepared.

Similar work on citrus was started and a great deal of useful data on the description of eighty varieties were collected. Photographic illustrations of 50 varieties were also completed.

Vegetables and Tuber Crops

Research on tuber crops

Seven research schemes on the tuber crops were in progress in the State of Madras, Bombay, the Punjab, Bihar, Orissa, Mysore and Travancore-Cochin. The object of these schemes was to evolve better varieties of tubers grown in various States.

Sweet potato (Ipomœa batatas). In Madras four varieties of sweet potato out of nine gave higher yields than the local varieties. In another yield trial with seven seedling types using I.B.22 as standard, only I.B.33 was found superior to I.B.22 and the latter variety was superior to I.B.34 and I.B.35, but equal to other four types, I.B.51, I.B.41, I.B.52 and I.B.54.

In Bombay ten promising varieties of sweet potatoes were compared with B.4004 and C.L.44 for their yield, number of tubers per plant, thickness of tubers and yield of tops per plant as fodder. Variety B.4004 proved superior in yield to the rest of the varieties and C.L.44 to B.2 only. As regards number of tubers per plant, C.L.44 proved superior to the rest, except Padegaon 3 and Bohari red. The Red India and B.2 varieties produced higher yields of tops than the rest.

In the Punjab, twelve varieties of sweet potato were compared with local types. All varieties gave higher yields than the local types, V.2 being significantly superior to all the other types. V.29 gave significantly higher yield

than all types. In another varietal trial it was observed that early planting was better than late planting.

Experiments on this crop were conducted at Sepaya and Barai in Bihar. At Sepaya, 30 varieties of sweet potato were compared for their yields with six local varieties. Varieties V.8, V.1, V.26, V.3, V.13, and V.15 were found superior in yield to the rest. In four other yield trials with nine American varieties received from Almora and three local types, varieties 5941, B.4004 and No. 14 proved superior to others. At Barai, ten American varieties were tried against material L.1. Varieties Ranger, B.4306, B.4004, B.5941, B.196, No. 4 and L.1. proved superior to others in yield. In a manurial trial at Musheri on the yield performance of sweet potato with different organic and inorganic manures, it was found that the application of superphosphate increased the yield.

In Travancore-Cochin, a collection of 96 varieties of sweet-potato was made. Cytological studies of twenty species of *Ipomoea* and several varieties of *Ipomoea batatas* were completed. In all the varieties the somatic chromosome number was 90. Out of the twenty other species studied, the number was 30 in eighteen. Only two varieties, *viz.*, *I. repens* and *I. uniflora* showed a somatic chromosome number of 60.

In Mysore collections of local and exotic types were made for trial purposes. The varieties Raya, Deenbandhu, Hosur green and Hosur red gave the highest yields of 550·92 lb., 713·03 lb., 528 lb. and 687·08 lb. respectively from amongst the ten local varieties tried.

Tapioca (Manihot utilissima). In Madras, 21 more types were collected and added to the previous collections at Coimbatore.

In Bombay eight Travancore varieties of tapioca were obtained for trial purposes. At Poona green and red stemmed varieties from Travancore and a variegated leaf variety from Madras were under observation. Under irrigation and manuring, the plants yielded 15 lb. of tubers. A single plant of red stemmed variety gave a record yield of 63 lb.

In Travancore-Cochin 275 varieties were collected out of the varieties grown in the State and Malabar. Three varieties obtained from Brazil and six varieties imported from Malaya were also added to the collection. The hybrid no. 105 gave higher yield than other 31 hybrids. The chemical analysis of hybrid no. 105 for variations in starch was continued and the work was extended to seven more varieties.

Other tuber crops. In Bihar, research work on other tuber crops, *viz.*, *miscrik*, *sulhni*, *haldi*, *kachchu*, *alti*, *khamarua* and *oel* was continued during the year.

In Bombay research work was conducted on two other tuber crops, *viz.*, *Colocasia* and *koorka*. In *Colocasia* eighteen fresh samples were collected and grown along with previous collections. Sample numbers 12, 30, 32, and 40 were found better. Selections 2 and 12 of the last year proved better than the fresh samples collected this year from the point of tuber formation.

In Punjab agronomic trials were conducted on *Colocasia*. Five varieties were compared with local varieties. Varieties S.2 and S.9 were found superior to local varieties. Early planting was found to be a better practice. One

hundred pounds of nitrogen per acre as ammonium sulphate was found to be the best dose. A space of 1½ sq. ft. per plant was found to be the most economical space.

Research on vegetables

Two research schemes on the improvement of vegetables were in progress in the Bombay State and Uttar Pradesh. The main objects of these schemes were the improvement of the existing varieties, breeding of new varieties, improvement of cultural methods, manurial requirements and control of pests and diseases.

Tomato. In Bombay the work was conducted during the *kharif* season. Out of 65 varieties tried, 32 varieties were received from the Indian Council of Agricultural Research and 33 were obtained from various other sources. The yield of various varieties varied from 78 lb. to 552 lb. per 100 plants.

In Uttar Pradesh, 403 single plant selections were made on the basis of different characters such as habit, flowering, fruit size, shape and colour, thickness of skin and its tendency to crack, taste, seed core, quality of seeds, and number of plants resistant to mosaic. The number of ripe fruits picked, their weight and the amount of seeds produced per plant were recorded for each selection for further trials.

Bhindi. In Bombay 82 varieties were collected from various places. These were tried during the *kharif* season. All of them were found to be susceptible to mosaic virus. The yield varied from 1·01 to 27 lb. per 100 plants.

In Uttar Pradesh, 207 single plant selections were made on the basis of habit, stem, colour, pod colour, number of ridges, apex and surface of pods. Four main types of *bhindi* were observed, *viz.*, (*a*) thick podded, green (With more than five ridges), (*b*) thin podded, green (with five ridges), (*c*) dark green and (*d*) red podded. Search for mosaic resistant plants was also made.

Brinjal. In Uttar Pradesh 159 single plant selections were made. The main classes among them were found to possess long or round fruits, deep purple, light purple or green white in colour. Some varieties were also found to be dwarf in habit and some fruited in clusters of three or even four.

Other vegetables. In Uttar Pradesh research work was also in progress on bottle gourd, muskmelon, *kakari*, turnip, radish and onion.

Leafy vegetables. In Bombay, the research work was conducted on the following leafy vegetatbles : (*a*) *methi*, (*b*) *palak*, (*c*) *chakvat*, and (*d*) *rajgira*.

The varieties 4,12, 3, 9, 6 and 5 of *methi* were found promising out of the 12 varieties tried ; the yields varied from 2,750 to 4,400 lb. of green material per acre.

Ten varieties of *palak* were tried. Great variations were observed regarding the performance of the crop. The yields varied from 3,400 to 10,700 lb. per acre.

Ten varieties of *chakvat* were grown. The yields varied from 240 lb. to 1,100 lb. per acre.

Eight varieties of *rajgira* were tried ; of these three varieties did not germinate and the yield of the rest varied from 3,900 to 8,750 lb. per acre.

Spices and Condiments

The Spices Enquiry Committee, set up under the auspices of the Council to enquire into the problems of production and marketing of six important dollar-earning crops of South India, *viz.*, pepper, ginger, turmeric, cardamom, cashew-nut and lemon-grass completed its investigation during the year under review (Apendix XIV). In order to gain first hand knowledge of the problems of these industries, the members of the Committee visited the main producing areas in Travancore-Cochin, Coorg, Mysore, Madras, Malabar and South Kanara and interviewed the representatives of various interests concerned, such as the growers, merchants, trade associations, co-operative institutions, Government officials, etc. The evidences collected are being analysed with a view to prepare the final report of the committee.

The results of the scientific investigations in connection with spices and condiments during the year are given below in brief.

Cardamom (*Madras*)

Nursery technique was investigated and experiments were laid out to find out (*a*) the effect of varying soil texture on germination and stand of seedlings (*b*) the effect of per-treatment of seeds on germination of seeds, (*c*) the most suitable mulch for the primary nursery, (*d*) the effect of treatment of seeds with different seed dressing fungicides on germination of seeds and incidence of diseases in the nursery, (*e*) the relative merits of different fungicides, their optimum strengths and the intervals of their application for successful control of fungous diseases in the primary nursery, and (*f*) the effect of treating the seed-bed with fungicides before sowing. Reliable results were obtained in some of the above experiments, while other investigations were still in progress.

An experiment to study the good effects of scarifying seeds by shaking them with fine and coarse sand was started in 1949 and repeated in 1950. The results showed that the scarified seeds gave a slightly higher percentage of germination.

Measures to control clump-rot disease in cardamoms caused by *Pythium vexans* and *Pythium aphanidermatum* were worked out. *Taeniothrips cardamom* R. was found to be worst pest on cardamoms. This pest has now spread all over the cardamom growing areas in South India causing heavy damage to the crop resulting in lower yields and poorer quality of produce. Nicotine sulphate 0·05 per cent applied as a spray and dusting with Gammexane D. 025 proved to be very effective and superior to all the other insecticides in controlling thrips and was also economical. Hybridisation between the various types of Singampatti cardamoms was continued. During the year 523 crosses were made. The first set of eight selections from the Singampatti cardamoms, that were planted in 1948 for yield trials on a field scale, started yielding during the year. The first harvest was taken in October. The annual weeding and mulching were one in the summer months. The selections were coming up well. It was found that the sheds over the primary nurseries should not be longer than six feet, so that the beds under them got enough light from either side. Fumigation did not effect germination adversely. The percentage of germination in fumigated seeds was higher than that in the on-fumigated seeds.

Cloves (*Travancore*)

In order to secure good and healthy seedlings in the farm, a nursery with 15 lb. of clove seeds was opened in the area. A few plants were found to be affected by a fungus disease. The fungus attacked the plants at the collar region and caused wilting. The disease is under investigation.

Inter-cropping with short duration food crops was tried but no significant results were obtained.

Turmeric (*Orissa*)

Turmeric seeds germinated better under natural conditions. Although the length of time taken for germination was comparatively longer, except in case of seeds treated with moderately hot water, the percentage of germination was higher under natural conditions. The treated seeds behaved alike both under laboratory and field conditions. No difference in earliness of sprouting was observed among the treatments in case of moist sand ; in the moist soil all rhizomes and in case of moist saw-dust and moist paddy straw 40 per cent. and 85 per cent. rhizomes respectively showed sprouting in 19 days.

It was observed that the sprouts 8 in. and 10 in. in length yielded best and the percentage of mortality was nil.

Out of 12 samples received from different stations, turmeric from Bamodh Saharanpur, Betul, Ranchi and Penali yielded better than the local *G. udayagiri* taken as the standard. Betal was significantly superior to all other types, *viz.*, Poona, NWFP., and Chinana.

The product obtained, after curing in dried turmeric leaves with water and in lime water, was better in colour than that obtained after treatment with cow-dung and water alone.

Coriander (*Madhya Bharat*)

A detailed morphological and cultural study of the organism causing the wilt disease was made in the laboratory. The fungus was grown on a number of media recommended by Woolenweber and Doidge at room temperature (21°-25°). Sporodochia, pionnotes, micro-conidia and chalmydospores were produced on a number of media, whereas pigment and micro-condidia were evident on a few media. All cultures were aromatic. Morphological and cultural study revealed that the organism causing wilt in coriander resembled *Fusarium oxysporum*, but the study of the host range of the latter showed that the fungus confined to its host and it was not recorded on coriander. Therefore, it must be a new form of *F. oxysporum*. It was also observed that the *p*H of the soil had no effect on the incidence of the disease.

Ginger (*Madras*)

Ten varieties, Cheranad, Walluvanad, Jorhat, Chinsurah, Narasapatnam, Razole, Atmakur, Travancore, Burdwan and British Guiana were planted. Razole variety gave the highest yield recording 7,177 lb. per acre. The varieties from British Guiana, Razole, Narasapatnam and Chinsurah showed more vigorous growth during the vegetative phase than even the local varieties. In the comparative field trial laid out with Charanad, Walluvanad and Jorhat varieties, Walluvanad variety gave the highest yield of 13,050 lb. per acre.

Chillies (Madras)

The season was adverse to chilli crop for the third year in succession both in nursery and in the field. The crop was generally poor and stunted in growth in all the breeding and agronomic trials. Thrip incidence was much earlier and white ants caused extensive damage to the varieties from the United States.

The trial on cultivators' holdings with G. I. and 1402 was repeated for the second year in succession. The yield data from sixteen centres revealed the superiority of the strains over the local.

Pepper (Madras)

Morphological and blossom biological studies on pepper varieties were in progress. Observations made during the year on all Malabar varieties and a dozen Travancore varieties of cultivated pepper and three wild forms received from different sources in the Western Ghats showed that the wild forms were all monoecious and the cultivated ones were all dioecious (hermaphrodite). Among the cultivated varieties and forms there was a vast variation with regard to their hermaphroditism. The flowers produced on the hermaphrodite varieties were bi-sexual, female and male. The proportion of male flowers was very small ranging from nil to 19 per cent. In varieties where the percentage of hermaphrodite flowers was low, female flowers predominated. Thus the cultivated varieties were either predominantly hermaphrodite or predominantly female. Examination of fruit setting in these varieties showed that the percentage of fruit setting was directly proportional to the percentage of female flowers produced by them. It was also observed that intense shade tended to produce more female flowers than hermaphrodite flowers in hermaphrodite varieties. The percentage of fruit setting was one of the most important factors affecting yield in pepper and the existence of a vast variation in this respect among the varieties and forms of pepper clearly indicated the great scope for the improvement of the crop by selection.

Medicinal Plants

The object of the schemes regarding selected medicinal plants, which have a demand both at home and abroad, was to find out the climatic and other requirements under which they would develop optimum alkaloid content. The West Bengal Centre will be started from April 1, 1953. The Madras scheme will be taken up soon. This year the Council sanctioned two more centres for Kashmir and Assam.

At Chakrata (Uttar Pradesh), a scheme for growing medicinal plants specially *Artemisia* or santonin, was in operation from April 1952, under the auspices of the Fruit Research Institute, Dehra Dun.

CHAPTER III

ANIMAL HUSBANDRY RESEARCH

THE tenth meeting of the Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry in India was held at Poona in March 1953. The items on the agenda were discussed by the Livestock, Dairying and the Animal Health Committees.

The Livestock Committee, while reviewing the progress of the working of the Key Village Scheme made the following recommendations :

(i) The staff employed under the scheme should be thoroughly familiar with the scheme and its technical programme, should mix with the villagers and help them in all possible ways.

(ii) The resources of farm-bred bulls should be pooled together and allotment made by a central agency to each key village unit in accordance with its requirements.

(iii) The breeding policy should be to replace natural breeding by artificial insemination as quickly as possible and central artificial insemination stations should be set up to serve all areas within reach of 24 hours.

(iv) Sufficient staff should be provided at the headquarters of the States for primary supervision and administration and at the headquarters of Central Government for effective co-ordination and guidance of the work. The provision under contingencies should be suitably increased to enable the necessary drugs and instruments for the treatment of cases of sterility to be purchased and to provide for more attractive prizes at cattle shows. A non-lapsable grant of Rs. 15 lakhs should be set apart to provide a working capital to help the villages in the storage or preservation of fodder and in the establishment of marketing organisations.

(v) The Community Project Areas should have a special type of key village scheme including all aspects of livestock development. The Community Projects Administration should also have an Animal Husbandry Adviser on their staff.

(vi) Investigation work on the introduction of foreign bulls for grading up non-descript cattle in certain hilly areas should be taken up in a central farm like the one at Mukteswar and in pilot village projects of the Indian Council of Agricultural Research. The Council should also appoint a special committee for guiding the working of these projects and also advising those States, which want the introduction of foreign bulls in their backward areas.

In regard to the rapid development of indigenous grasses and legumes, the recommendations made by the committee include the introduction of legumes

in crop rotation, preference of fodder plants in soil conservation programme, control of duration and intensity of grazing in grass-lands, revival of the Fodder and Grazing Committee, and the appointment of an agrostologist in each State for pushing up work of this kind.

The Dairying Committee discussed a number of important and pressing problems connected with the dairy industry. The committee considered it essential that rural areas should constitute the main source of supply of milk in the country and that in order to fully develop the potentialities of these areas, the State Government should set up necessary organisation for the purpose. The importance of providing adequate transport facilities, including all weather roads for the collection and marketing of milk and also providing refrigerated and insulated vans and concessional rates on the railways for the transport of milk from rural areas was stressed. The committee also felt that the milk production in rural areas should be developed through mixed farming in which fodder production should form an integral part of the scheme. The setting up of Central Dairy Information Bureau for the dissemination of information useful to the trade was also discussed and recommended.

Under a separate resolution the committee considered the feasibility of introducing uniform standards and quality control of market milk in India. The question of hygienic quality control of milk was also discussed. In the opinion of the committee there was an urgent need for introducing and enforcing measures for production and handling of clean milk. Certain tests were suggested for judging the hygienic quality of market milk. Owing to the inadequacy of milk supply, high cost of producing milk and seasonal fluctuations, " toned milk ", made by mixing buffalo milk with skimmed milk powder and water, would have a place in the urban milk supply till such time as the level of production of milk in the country was increased. The committee felt that there was a definite possibility for the manufacture of milk powder in the country during certain seasons and in certain milk pockets and Governments should explore every means for setting up milk powder plants at an early date.

In its deliberations, the Animal Health Committee had the benefit of the valuable advices of Sir Thomas Dalling, an eminent scientist and Senior Veterinary Consultant at the Food and Agriculture Organisation Headquarters at Rome and Mr. R. Daubney, Rinderpest Consultant allotted to India by the Food and Agriculture Organisation. The committee after careful consideration recommended the taking up of a pilot project for the eradication of rinderpest on a sufficiently large scale in suitable areas in the South. To work out this, the committee recommended the appointment of Central Rinderpest Control Committee to function under the Indian Council of Agricultural Research to control, progress and administer the pilot project. In order to improve and utilise the disease investigation service to the best advantage, the committee recommended that this staff should become a nucleus for the gradual development of full-fledged research units, such as a livestock research station for each of the States. With a view to facilitate export of animal casings, the committee recommended that the Government of India might explore the possibilities with the Government of the United Kingdom and United States to accept our products and recommend to the State Governments certain measures for further improvement of the indigenous products.

Cattle Breeding

A sub-committee of the Animal Breeding Committee of the Council was appointed to examine the working of the Livestock Investigation Scheme at Hissar.

The committee was satisfied that sufficient data were available and that there was every chance of fruitful results coming up, if the work on the technical programme of the scheme was continued. It was also observed that the scheme had been worked in accordance with the detailed breeding schedule laid down and that the first batch of bulls with known pedigree and records of performance were ready for issue or use.

The committee was of the opinion that as an experienced officer had been recruited for working the scheme and as a large number of bullocks were available, the reintroduction of the work on draught test in the scheme was justified.

The committee recommeneed that from the foundation cows, those still capable of breeding, with past records of regular breeding and high yields, should be retained and the rest might be culled. In regard to the female progeny of cows included in the scheme, it was decided that irrespective of the colour type or other defects of conformation, all females should be retained till they completed the first lactation.

With regard to culling of male stock, the committee recommended that from the foundation sires, none should be discarded till such time as one bull of proven merit had been found by progeny test. In the case of the mature male progeny, at least six bulls per family should be selected with due regard to high yields of the dams and good body conformation and retained, while the rest might be culled. On the completion of the evaluation of the transmitting ability of the foundation bulls, the six mature bulls belonging to the family with the best records need only be retained for further propagation and the rest culled.

The committee strongly recommended that the feeding of the experimental animals should be arranged on a uniform basis, and that all animals should be stall-fed and no grazing should be allowed. This would ensure that the animals would not be exposed to the risks of famine conditions and that the results obtained would not be vitiated by extraneous considerations.

The recommendations of the *ad hoc* committee were communicated to the Punjab Government for implementation and it was decided to continue the scheme till March 31, 1956.

The Pilot Key Village Scheme and the artificial insemination centre for livestock sanctioned by the Council for the Delhi State were continued and the scheme was becoming popular among the villagers.

The Cattle Improvment and Insurance Scheme in PEPSU was progressing satisfactorily. There were requests from two or three organisations near Patiala, engaged among other things in milk supply, for the inclusion of their animals in the insurance portion of the Council's scheme. Unfortunately, the scheme had to be terminated before the completion of its first five-year period due to the reversion of the officer-in-charge of the scheme to the Punjab.

However, the scheme demonstrated that insurance of cattle was a profitable proposition to both the insurer and the owner of the animal.

The progress made under the Kangayam Cattle Improvement Scheme, Madras, appeared to be satisfactory, but the results were vitiated owing to the prevalence of scarcity conditions, which affected feeding very seriously and rendered dam-daughter comparisons impossible. The matter was, however, gone into and provision was made for uniform feeding from generation to generation. But this was done only recently and it was yet premature to look for results. In the revised technical programme, arrangements had also been made for testing at random half of the male progeny for breeding and the other half for draught. The animals selected for breeding were being used by the Madras Government in their general bull distribution scheme. The State Governments have been requested to maintain proper records of breeding and production, so that the breeding value of the bulls distributed might be examined in course of time.

At the Indian Dairy Research Institute, Bangalore the scheme for putting milch cows to work continued to function satisfactorily. The object was to investigate the possibility of using milch cows for light work without adversely affecting reproduction or lactation. Sindhi cows were used in these experiments. Although the results reported in the report for 1951-52 indicated that the cows used for work did not suffer in any way, it was however considered premature to draw any definite conclusion at present, as the scheme had been running only for a short time. Two additional centres were sanctioned, one at the Cattle-cum-Dairy Farm, Karnal and another at the Indian Veterinary Research Institute, Izatnagar.

The study of the breed characteristics of the various grey breeds of cattle found in the country was completed during the year under report. The information collected by the Special Officer appointed for the purpose were forwarded to the Directors of Animal Husbandry concerned with a request that they might examine it and furnish such amendments as they considered necessary so that the breed characteristics of these grey breeds might be published in final form and might be used in judging animals at cattle shows.

Another mile-stone in the development of animal husbandry research reached during the year was the finalisation of the proposals connected with research on artificial insemination of cattle in the country and the selection of places for the location of regional centres. The following institutions were selected in the various regions :

1. Eastern Region	..	(1) Veterinary College, Belgachia, Calcutta. (2) Veterinary Hospital, Cuttack.
2. Southern Region	..	(1) A. I. Centre, Boat Club Buildings, Poona.
3. Northern Region	..	Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh. In addition to undertaking regional problems, work on fundamental problems would also be continued at the Institute.
4. Temperate Region	..	Deferred, till work developed in this region

The technical programme of work of these centres would be settled in consultation with the Head of the Division of Animal Genetics, Indian Veterinary Research Institute and the Officers-in-charge of these centres.

During the year the Council considered several important schemes of research on breeding of cattle and mention might be made of the important ones. The International Cattle Breeding Conference of F. A. O. recommended that work should be initiated in India, the results of which would be applicable to all other tropical countries, for the purpose of studying the behaviour of breeds of all India importance, such as Sindhi, Sahiwal, Tharparkar, Hariana and Gir cattle in areas of heavy rainfall. A scheme was sanctioned for work in West Bengal.

A scheme for the investigation of pregnancy diagnosis tests in animals was sanctioned for a period of one year for simultaneous execution at three centres, *viz.*, Calcutta University, Indian Veterinary Research Institute, Izatnagar, and Indian Dairy Research Institute, Bangalore. The object of the scheme was to investigate the use of faeces for hormonal method of pregnancy diagnosis in farm (cows, ewes, buffaloes, goats, etc.), laboratory (guinea pigs, rabbits, etc.) and wild animals.

The cattle found in the hilly areas of the country were poor in milk yield and did not conform to any breed description. In order to improve the cattle of this area the Council sanctioned a scheme for Himachal Pradesh.

Two important schemes relating to fundamental research were sanctioned at the Indian Veterinary Research Institute. One was for the study of immunogenetics of Indian cattle. The other scheme was for the fundamental study of quantitative inheritance. It is proposed to set up a *Drosophila* fundamental quantitative genetics laboratory at Izatnagar, where studies would be initiated on a number of selected characters with polygenes as their determinants, so that within a comparatively short period sufficient data covering hundreds of generations would be obtained and subjected to rigorous statistical scrutiny with the object of evolving suitable techniques for use in animal selection experiments.

Another important scheme, which was accepted for inclusion in the National Plan, related to setting up of regional centres for the study of the incidence and causes of cattle infertility with a view to evolving appropriate control methods. The advice of F. A. O. experts in gynaecology was sought with a view to finalising the details.

Sheep Breeding

Scheme for the improvement of sheep and wool

A scheme for the improvement of sheep and wool on regional basis was sanctioned by the Council in 1951.

In the Temperate (Himalayan) Region, the Regional Centre is located at Pipalkoti (Garhwal) in the Uttar Pradesh hills with a fleece testing laboratory situated at Kalsi in Dehra Dun district and a sub-centre at Banihal Farm in Kashmir. The work at all these centres was in progress. A second sub-centre in Himachal Pradesh for the same region was also sanctioned.

In the Northern Region, which is dry, the Regional Centre in Rajasthan and the sub-centre in Joria (Bombay) were sanctioned. Analysis of wool

samples would be carried out at the existing laboratory of the Rajasthan Government at Jaipur and the Wool Analysis Laboratory at Poona.

In the Southern Region, the existing Sheep Breeding Centre at Poona was expanded to perform the functions of the Regional Centre and a Wool Research Laboratory was attached to it. A sub-centre in the Nilgiris (Madras) was also sanctioned. Another sub-centre is expected to be started in Mysore.

The work at each sub-centre would be carried out in close collaboration with the related Regional Centres. Analysis of the wool fibres would be done at the regional laboratories attached to these principal stations.

Sheep Breeding Scheme, Eastern Region, Bihar

As it was felt that wool yielded at present by the sheep in the heavy rainfall areas did not show any outstanding character for selective breeding, a scheme was sanctioned for Bihar in the Eastern Region for five years from April, 1953. The object of the scheme is to study the suitability of Romney Marsh, Cherriot and Gaddi breeds of sheep in this region and the improvement which could be effected by cross-breeding rams of these with local ewes. The work under this scheme would be restricted for the present to one area alone in Sasaram-Shahabad district of Bihar, and the analysis of wool samples would be carried out at the existing Wool Analysis Laboratory at Gaya.

Sheep Breeding Scheme, Poona

The flock of Deccani sheep yielded fleece with medullation index less than 2 and diameter from 30 to 35 microns, as against the previous lot with 35 to 40 microns. There was also a slight increase in wool yield. The lambs born from this flock showed variability in the fleece ranging from 20 to 40 microns.

Selection of rams on the basis of dam-progeny comparison is an important item to be studied in a sheep breeding research station. A detailed study carried out during the last three years indicated that for the comparison of fleece density, the earliest age was seven months, and that for diameter, length and percentage of fine fibres the comparison could be undertaken any time after the age of two months.

A detailed study of the yields of mutton by the Deccani and Tenguri sheep gave valuable data indicating the method to be followed in assessing the meat yielding character and in standardising the technique that might prove useful for the laboratory and commercial aspects of the problem of meat production.

Scheme for research in developing mutton breeds of sheep, Southern Region

With the object of studying the potentialities of three breeds of mutton sheep existing in South India, *viz.*, Nellore, Mandya and Tenguri and of exploring the possibilities of obtaining superior hybrids both by inter-breeding and out-breeding, a scheme was sanctioned for taking up the work at three centres, *viz.*, Bombay, Mysore and Madras.

Wool Analysis Laboratory, Gaya

The analysis carried out at this laboratory helped in selective breeding and up-grading of flocks in farms by recording the wool quality of individual sheep. The laboratory also recorded the individual performance of lambs produced by crossing the *desi* with Bikaneri ewes or rams. This laboratory, *inter alia*, would also cater for the needs of the the Eastern Region for analysis of the wool samples.

Wool Analysis Laboratory (Bombay University)

The Wool Analysis Scheme, at the Bombay University, was started in 1940 and good work was done under that scheme for studying characteristics of wool fibres from all over the country including trade samples. With the establishment of regional sheep and wool improvement centres, and attached wool research laboratories, it was considered that this scheme would be no longer necessary. The scheme was extended upto 31st March, 1953 in order to enable the completion of work on chemical studies already in hand.

Training in sheep and wool production

A diploma course for training in sheep and wool production was instituted at the Government Livestock Farm, Hissar for a period of one year as an experimental measure. It actually commenced in September, 1952. It was observed that major States like Madras, West Bengal, etc., had not taken advantage of this training and only five candidates were deputed from the States of Rajasthan, Hyderabad, Saurashtra, Ajmer, etc. In consultation with the Punjab Government, training was merged in Sheep Research Scheme recently initiated at the Government Livestock Farm, Hissar with a view to get a systematic improvement of sheep and wool, standardisation of methods and for conducting fundamental research relating to the genetic behaviour of different characters, especially the heritability analysis of various utility factors as aid for selection.

Goat Breeding

Indigenous Goat Breeding Scheme, Punjab

The scheme, which had as its object the building up a flock of Beetal breed of goats of superior milk strain by suitable breeding methods, was in progress at Hissar from November, 1939. During the year the percentage of mortality in kids up to the age of one month was noted for a comparative study. The observations were as given blelow :

First period	July to October	7 per cent.
Second period ..	March to June	19·7 per cent.
Third period	November to January ..	34·4 per cent.

These findings gave further support to the inference already drawn from data in previous years that kiding in the first period, *i.e.*, July to October, adopted as a general routine of breeding goats, was a sure way to reduce the high mortality in kids.

In order to examine and suggest new lines for the working of the scheme, a sub-committee was appointed to examine the scheme and to recommend lines of improvement. The sub-committee recommended that the technical guidance and control of the scheme be vested with the Animal Geneticist-in-charge of the Livestock Investigation Scheme. The

sub-committee observed that while no doubt mortality in kids was heavy in the second part, the remedy for it lay not in manipulating the seasons of mating but in better disease control by ascertaining the causes of diseases and the proper methods of controlling them. The scheme was accordingly transferred to the control of the Animal Geneticist.

Goat Improvement Scheme, Travancore-Cochin

The Council sanctioned a scheme with the object of selective breeding of Malabar goats, which are known to contain predominantly Surti blood, in order to develop the potentialities of the breed and for distribution of progeny tested bucks from this scheme to the rural areas. Due to delay in procurement of good stock, work actually started in March 1952. The scheme was working in accordance with the approved technical programme.

Angora Goat Breeding Scheme, Uttar Pradesh

This scheme on its transfer from the Punjab was in progress at Pipalkoti in the Uttar Pradesh hills since April 1950. The favourable season at Pipalkoti was from April to June, with sunlight, dry atmosphere and good grazing. All animals except Angora bucks and graded stock were sent to Selakharak *bugial* during summer for grazing, but they did not show enough improvement in condition as compared to the graded animals kept at the farm. It was felt that rainfall in Selakharak *bugial* was often heavy, which adversely affected the condition of the livestock, especially the kids and lowered their vitality besides causing foot-rot. Hence, a better *bugial* for summer grazing was selected for future. The best mating period appeared to be the months of October and November, so that kidding might take place during March and April.

There was low mortality in graded stock and none in Angora bucks. This indicated gradual acclimatisation of these animals to the local environments. Mohair from different crosses was sent to the Industries Department, which prepared blankets from F_1, F_2, F_3 generation mohairs. The quality of blankets prepared from F_1 mohair was coarse. The blankets from F_2 and F_3 mohairs appeared to be good, though not very good. Carpets were also prepared and were fairly good. Articles like mufflers, monkey cap, pull-over, etc., were also prepared by the people of Pipalkoti out of pure Angora mohair. The articles were very attractive, soft and fluffy.

The pure Angora bucks came to rut only during September, October and November and not in other months of the year. Three of the four Angora bucks imported from the U. S. A. died due to disease and were replaced by the pure-bred Angora bucks obtained from the Bombay Government Farm.

Scheme for research on development of goat for meat and mohair

So far research work on sheep and goats had been devoted to breeding improved sheep for the production of better and more wool and goats for the production of more milk. Recently, it was decided to lay emphasis on the production of mutton as well. With this end in view, two different kinds of schemes were considered by the Council, one for developing strains of local goats for mutton production, and the other for developing strains of goats for mutton as well as mohair production using Angora. A model scheme

under the first category was circulated to various States with a request to submit suitable schemes on regional basis. As regards the second aspect, a scheme was already in progress in Uttar Pradesh. Another centre would be initiated at a suitable site in the Bombay State.

Poultry

Poultry Development Scheme, Madhya Pradesh

The ages of sexual maturity of F_5 grades of White Leghorn, Rhode Island Red, and *desi* were studied, those being 277·6, 289·7 and 248·7 days respectively. It showed a significant difference between Rhode Island Red and the *desi*, but differences between the *desi* and White Leghorn and between White Leghorn and Rhode Island Red were not significant.

A reduction in egg production of F_4 grades of Rhode Island Red and White Leghorn over F_3 was noticed. This was probably due to genetical factors. In *desi* birds egg production, however, increased from 78·0 to 107·5 and between Rhode Island Red and White Leghorn grades (F_4), the latter laid 5·5 eggs more.

Egg size increased in the successive generations in both the grades and *desi*. In F_5 also for five months a upward trend was noticed, the weight of eggs from Rhode Island Red and White Leghorn being 3·06 to 1·89 ounces respectively.

Incubation of eggs was studied and data about percentage of hatchability, etc., were collected. Results in F_5 generation were better than those in F_4.

Growth of chicken was also studied. A uniform increase in weight of sixth grade chickens was noticed. It was observed that average body weight of 1 lb. was attained by the sixth grade chickens of Rhode Island Red after 11 weeks and of White Leghorn and *desi* after 12 and 14 weeks respectively.

Body weights of F_5 grade of birds were compared with the pure ones and it was found that differences between females of grade F_5 and those of the pure birds in Rhode Island Red and White Leghorn was 32·3 per cent and 24·2 per cent respectively.

During the year under report, there was an overall mortality of 43·9 per cent in F_5 grade adult birds. Mortality was highest in *desi* chickens as in the last year. Deaths were due to various reasons but coccidiosis was absent.

Hay-lined baskets were found suitable for rearing chicken under village conditions, although mortality was slightly higher than those reared under electric light.

During the year 6,032 graded and 4,870 *desi* eggs were collected and 21·3 per cent of the eggs collected were hatched, as compared to 12·8 per-cent hatched last year.

Greater efforts were made to make the egg marketing project at Shahpur more effective. Purchase rate of eggs, however, remained high and so profit was less than last year.

Poultry Development Scheme, Travancore-Cochin

The scheme was started at Trichur early last year with the object of finding out, if pure-bred stocks of White Leghorn and Rhode Island Red

could be satisfactorily maintained and distributed to the villages for development on a large scale for grading up operations.

Duck Breeding Scheme, Bihar

Under this scheme useful observations were made about egg production, egg size, growth rate of chicks, etc. Under conditions in Bihar, it was found that the Indian Runner was a better layer (95·1) than the Khaki Campbell (56·5), as compared to local ducks. The average productions were however low, but observations for another two or three years would be needed to arrive at a definite conclusion. Like fowls, in both the breeds, egg production was the best in early summer. Except at the time of moulting in October and November, the egg size in both the breeds remained more or less the same throughout the year.

Animal Nutrition

Indigenous grasses and leafy fodders

A scheme to determine the value of indigenous grasses at the flowering stages and the leafy fooders had been in operation since 1944 at the Indian Veterinary Research Institute. During the year investigations were extended to study the nutritive value of eight species of leafy fooders, *viz.*, *khair* (*Acacia catechu*), *bankli* (*Anogeissus latifolia*), *kusum* (*Schleichera trijuga*), *sal* (*Shorea robusta*), *phaldu* (*Mitragoyna parvifolia*), *khoda* (*Ehretialaevis*), *gauj* (*Millettia avriculata*), *marorfali* (*Helicteres isora*). Feeding experiments were conducted on Kumaoni bullocks. The results indicated that *khair* leaves form a suitable protein rich roughage and could constitute a maintenance ration. *Bankli* leaves were palatable, but on account of low digestible crude protein and low consumption of dry matter, supplementation with a roughage and a good concentrate appeared desirable. In combination with *bhoosa* and a small amount of rape-cake, *kusum* leaves could form maintenance ration. It was also noticed that more than half of the digestible crude protein requirement could be met from these leaves. *Sal* leaves could only form a maintenance ration for cattle, if supplemented with the necessary quantity of rape-cake and wheat *bhoosa*. Addition of another feed, laxative in character, would however be necessary to counteract the constipating effect of the leaves. The *phaldu* leaves were not palatable enough as to form a maintenance ration, but in combination with rape-cake and wheat *bhoosa* they could form a major portion of the roughage. The palatability of the *khoda* leaves was poor and it could not be used as a single feed, inspite of its high crude protein content. The *mororfali* leaves were palatable and quite rich in all the essential nutrients, and the forest departments had been advised to encourage its cultivation and to control its indiscriminate lopping, as the shrubs might be useful for providing a very nutritious fodder. The *gauj* leaves also could form a satisfactory maintenance ration.

Sheep Nutrition Scheme

This scheme, which was initiated on 5th November, 1948 at the Indian Veterinary Research Institute, was terminated in September 1952. Under this scheme investigations were made to determine (i) the dietetic requirements that were necessary to maintain lambs in health and to ensure their

optimum growth and (ii) the dietetics modifications required to produce deficiency symptoms for vitamin A, phosphorus, calcium and protein in lambs. A considerable amount of data were collected and they were under statistical examination for interpretation of results. It was observed that the sub-adequate amount of vitamin A in the diet of sheep resulted in the retarded growth and wool of inferior quality.

Work on paddy straw

Paddy straw constitutes about 50 per cent of the total roughage available for livestock in the country. The proportion for the heavy rainfall areas is still higher. In order to tackle this problem, a scheme for further work on paddy straw was sanctioned with a central unit at the Indian Veterinary Research Institute for improving the technique for enhancing the nutritive value of paddy straw and to study the injurious substances present in it. Two field units would be established at (i) Kangra (Punjab) and in (ii) Assam, which would act as demonstration centres for disseminating the results of researches on paddy straw.

Regional Centres for animal nutrition work

In pursuance of the Council's policy to start regional centres for animal nutrition, the first centre was established in February 1952. The second centre for the Southern Region would be located at the Indian Dairy Research Institute, Bangalore, while the third centre for the Eastern Region would be established at a suitable place in West Bengal. The technical co-ordination of the work at these centres would be done by the Head of the Animal Nutrition Division, Indian Veterinary Research Institute, Izatnagar, U. P.

As it was observed that cattle degenerate, as they were taken from the north-western parts of the country to the east and south, a scheme to investigate the causes of degeneration of Hariana heifers, was recently started at Calcutta.

Another scheme was also initiated at the Indian Veterinary Research Institute with a veiw to studying the influence of trace elements like iron, copper, iodine, molybdenum and manganese on health and productive capacity of livestock in the country.

Disease Control

Schemes for the investigation of diseases of cattle, sheep and goats and poultry continued to function in the various States and at the Indian Veterinary Research Institute. Most of these schemes on cattle and poultry had since been taken over by the respective State Governments, but their progress reports and technical programmes still continue to be scrutinised and co-ordinated by the Council. A new scheme for the investigation of diseases of sheep and goats for the State of Hyderabad was also sanctioned.

Diseases of cattle

Rinderpest. The Pilot Scheme, which was sanctioned as a fore-runner to an all India plan of complete eradication of rinderpest from the country by the use of lapinised virus vaccines, continued to function at the Indian Veterinary Research Institute. A total of 14,013 animals including cattle, buffaloes, sheep and goats were vaccinated using lapinised virus in different parts of the

country. The results of vaccination in cattle and buffaloes did not have any effect on the milk yield of animals. Vaccination had no untoward effects on the pregnant, lactating and newly calved animals. At some places sheep and goats, however, exhibited some thermal reaction. Immunity so far tested was found to be solid up to two years and ten months in cattle and one year and 9 months in sheep and goats.

Rinderpest was also investigated in the States of Madras, Rajasthan, Bihar, Bombay and Madhya Pradesh during the year under report. The position regarding this disease during the last ten years in the north Bihar range was reviewed. In Madhya Pradesh antigenicity of the ' desiccated virus ' and goat was under different conditions of storage and transport were determined. Fifteen hundred suspension of ' dry vaccine ' was found to give more satisfactory results than higher dilution. The weight of ' dry vaccine ' produced *vis-a-vis* ' wet ' spleen was, on an average, in the proportion of one-seventh of the material actually utilised for this purpose.

Mastitis. The co-ordinated scheme on the investigation of mastitis in Indian cattle continued to function at Mysore, Bombay, the Punjab and the Indian Veterinary Research Institute. As mentoned earlier the objects of all these schemes were to determine the extent of the prevalence of the disease by suitable diagnostic procedure, to find out the relative importance of different organisms involved in the causation of the disease, and to determine the efficiency of the different chemotherapeutic agents. In order to have comprehensive information, the technical programmes at different centres were modified. In future the examination would be extended to include all animals of the herd, whether in milk or dry, and systematic records of all the four quarters of each animal, whether directly affected with mastitis or not, would be kept. In Bombay and Mysore a large number of milk samples were also subjected to biological and cultural examinations.

In Mysore preliminary trials with ' Morellin ', an antibiotic were carried out, which appeared to have given satisfactory results. The Bombay and Mysore schemes were extended for a further period of three years.

Foot and mouth disease. The scheme for devising a suitable method of vaccination for the control of this disease amongst the Indian cattle and for typing of various strains of the virus in this country, continued to function at the Indian Veterinary Research Institute. Four viable strains received from the field were typed by cross immunity tests in guinea pigs. So far 69 Indian field strains had been isolated and typed. During this year one strain of virus from a natural case of disease in goat was isolated ; this was recorded for the first time in India. It was of ' O ' type and one interesting feature was its easy and rapid adaptability to guinea pigs. Till the end of March 1952, it was successfully maintained for six passages.

Six brews of crystal violet vaccine were prepared, two of which were monovalent, three bivalent ' O ' and ' C ' and one polyvalent. Field vaccinations were undertaken for the first time with crystal violet vaccine of all these three types. The animals would be tested for immunity in due course. In order to reduce the cost of crystal violet vaccine and to produce a vaccine with better immunising properties, further efforts were made to evolve a concentrated vaccine and the brews prepared gave satisfactory results under laboratory

conditions. Two proprietory drugs 'Mokhur' and 'Wales', which were claimed to be effective against the foot and mouth disease, were tried and neither of these were found to be effective.

Brucellosis or contagious abortion. Investigations on this disease were carried out in the States of Madras, Rajasthan, Bihar, Bombay and Madhya Pradesh. In Madras under village conditions, the incidence of the disease in individual herds was found to be very high, the rate of infection being as much as 50 per cent, while in the villages as a whole, it was 12-15 per cent. Out of 1,028 sera samples tested, 188 were positive and eight suspicious. In the new and old centres of infection 3,529 animals were vaccinated. In 18 centres vaccination done last year was found to have given satisfactory results. In Rajasthan no abortion in buffaloes, which were in the herd of affected cows, occurred. The sera from them could not however be put to agglutination test. In Bombay in all the institutions supplying large quantities of milk, brucellosis was the main trouble and at a certain place it was found to be playing havoc. In the agglutination test 18·2 per cent and 10·0 per cent positive cattle and buffaloes respectively were detected. In nine cases of abortion, material from foetus and dams were also found positive. Calf-hood vaccination and hygienic measures were adopted in badly affected institutions with satisfactory results. In Bombay material from two pigs belonging to Government piggeries was also found positive. In Madhya Pradesh, infection was detected in 12 out of 13 farms and in 12 out of 14 Key Village Centres, where tests were conducted. Samples of blood sera from bovines in Cattle Breeding and Dairy Farms, and Key Villages, 2,954 in number were subjected to agglutination test with 171 positive and 85 doubtful reactors. Control was effected at the farms and Key Village Centres by segregation, transfer of reactors and by calf-hood vaccination with 'strain 19' vaccine.

Tuberculosis. The Council's scheme for the investigation of tuberculosis and Johne's disease at the Indian Veterinary Research Institute, continued to function. During the year systematic survey of the incidence of tuberculosis was undertaken in Madras State, where about 16,963 cattle and 6,627 buffaloes were tuberculin-tested. Although detailed results of these tests were not available, the main observation was that the incidence of tuberculosis was much lower than in the States of the Punjab and Bombay, where similar survey were carried out previously. Like Bombay, however, the percentage of infection was higher in buffaloes than in cattle. At Mukteswar by repeated tests and elimination of reactors, a tuberculin-negative herd was established. In connection with the field survey work during the year under report, 7,680 doses of concentrated synthetic medium tuberculin were prepared. Typing of tubercle bacilli from human sputum was also undertaken. Incidence of tuberculosis was also studied in sheep and goats at the Indian Veterinary Research Institute. The percentages of positive reactors in Mukteswar was 1·81 in sheep and 5·5 in goats. It was interesting to observe that all these animals gave positive reaction to Johnin also.

Johne's disease. During the year in the Indian Veterinary Research Institute, 1,725 doses of concentrated synthetic medium Johnin were prepared. In order to find out the incidence of the disease at the Government Cattle-cum-Dairy Farm, Karnal, 833 animals were subjected to the D. I. D.

test out of which 4·8 per cent animals reacted positively. An interesting finding was that although about 20 per cent of the bullocks tested gave positive or doubtful reaction, none of the bulls tested evinced a reaction. The higher incidence in bullocks was attributed to the strenuous nature of their work. In Mukteswar out of 125 animals in the dairy herd, one gave positive reaction, but the incidence was rather high in sheep and goats being 21·5 and 21·8 per cent respectively. Animals round about Mukteswar were tested but no positive case was recorded.

Diseases carried by anaerobes. The scheme for the investigation of diseases caused by anaerobes, which was extended last year for a period of three years continued to function at the Indian Veterinary Research Institute. Certain 'Black Quarter' endemic areas and a few sheep farms in Madras and Mysore States were visited. Isolation and purification of *Clostridia* from the material collected from out-breaks and from those sent to the laboratory, was effected. Most of the organisms were typed by cultural and biological methods. Stock cultures of a number of pathogenic and non-pathogenic anaerobes were maintained for comparative studies. A number of cultures of anaerobes were supplied to the various institutions in India in response to their request. Out of 75 specimens, organisms of 'Black Quarter' were isolated from 70 specimens and purified. About 60 of the strains of *Clostridia* isolated during the year were typed. Anti-*Cl.chauvoei* and *Cl. septicum* were prepared from rabbits, using washed cultures and four strains of the former and two strains of the latter were typed by the agglutination method. From two natural cases of 'Black Quarter' in sheep, *Cl. septicum* was isolated for the first time in India.

Diseases of sheep and goats

The various Assistant Disease Investigation Officers (sheep and goats) undertook further survey of the common contagious diseases of sheep and goats in their respective States and information relating to incidence, symptoms, mortality, etc., was recorded.

Contagious caprine pleuropneumonia. In Bombay a comparative study of the immunity conferred by the crude lymph vaccine, Longley's carbolized or formalised vaccine and culture vaccine showed that the latter conferred immunity for 15 months and was the safest. In Mysore encouraging results were obtained by the formalised lung tissue vaccine.

Rinderpest. In Bombay the disease was reported throughout the year. The disease was investigated and confirmed in nine villages. Six thousand sheep were protected against rinderpest by lapinized vaccination.

Sheep and goat pox. In Bombay sheep pox was reported throughout the year. In all 58 outbreaks were reported. The vaccine from the Indian Veterinary Research Institute and Bombay gave good results when used in the face of actual outbreaks. In Mysore investigation into an adverse result of field ovination revealed that less than 50 per cent were reactors and they remained immune. The non-reactors started dying due to the disease, so a secondary vaccination was undertaken. A fully potent sheep pox vaccine was treated with penicillin in different proportions. Cultural tests revealed the treated vaccine as sterile, while the potency was not interfered with even after four weeks. Similar tests with goat pox virus were equally effective. Attempts to cultivate goat pox virus on membranes of the chick failed.

Rickettsiosis. The study on the causal organisms was completed and it was proved that the rickettsiosis isolated was a new species and named as *R. belgaumii.*

Contagious agalactia. In Bombay this contagious disease was recorded for the first time in goats. It was observed that 20 sheep in close contact with the affected goats did not get the infection. The eyes or udder of goats or both were affected. In the latter form mortality was 30 per cent, while in the former 13 and 15 per cent respectively.

Rabies. A scheme for the (*a*) eradication of rabies in large towns (*b*) manufacture of single dose prophylactic rabies vaccine and (*c*) establishment of a Rabies Research and Diagnostic Centre, was sanctioned from April 1953.

Co-ordinated scheme on helminthiasis

The livestock helminthic infestation scheme continued to function at the Indian Veterinary Research Institute. The Lucknow University Centre was closed on September 30, 1952 and the Madras centre was taken over by the State Government. The scheme at the Indian Veterinary Research Institute for the helminthic parasites affecting poultry, was extended for a period of two years.

Under the Indian Veterinary Research Institute scheme further studies on the life history of *Schistosoma indicum* were made. Out of 609 specimens exposed to miracidia of *S. indicum* in tap water, river water, rain water and tank water, only one snail of one group was found to shed cercaria of *S. indicum* after 43 days. Attempts were made to infect guinea pigs, rabbits and lambs. From guinea pigs and rabbits only female schistosomes were obtained on autopsy. Morphology of the miracidium, mother sporocyst and early daughter sporocysts was studied. During the course of study of the life history of *S. indicum.* a new schistosome cercaria was obtained from *L. luteola,* which was given the name *Orinthi bilharzia* Dattai. Rabbits, guinea pigs, buffaloe calves, cow calves, bullocks, sheep and goats, lambs and kids could be experimentally infected. The longevity and infectivity of this cercaria were also studied.

At Lucknow University the life history of *Moniezia expansa* was completed upto the cysticercoid stage. Work on the life history of *Avitellina centripunctata* and *Stilesia globipunctata* was continued. Many exposures were given to many colonies of mites, but cysticercoid stage could not be reached. From the study of infection in buffaloe with *Olveria indica,* it was ascertained that the parasite was not a rare one. It was never recovered alone from the rumen ; there was always a multiple infection. A large number of specimens of *Paramphistomum gotoi* were recovered this year.

Under the poultry helminths schemes, the natural and acquired resistance of birds to worm infestation was studied at the Indian Veterinary Research Institute. Work was under progress to study the natural and acquired resistance of chickens to *Helterakis gallinae.* Experiments conducted to study the acquired resistance of chickens to *Ascaridia galli* revealed that the primary infection of *A. galli* offered a very high resistance to the secondary infection. Results were confirmed (i) by giving subsequent higher doses of infection and (ii) by removing the worms of first infection by a dose of 2 c.c. of carbon-tetra-chloride and reinfecting the birds.

Indigenous drugs

On the recommendations of Animal Diseases and Pests Committee, a sub-committee was appointed, which met in November, 1952 at New Delhi and recommended about 20 drugs for trials. The sub-committee will continue working out details in regard to the different drugs recommended. A new scheme for further research into the indigenous drugs of India for use in veterinary practice was sanctioned at the Indian Veterinary Research Institute from April 1, 1953 for a period of one year with the object of promoting research on indigenous drugs and medicines in the veterinary field and making India self-sufficient with regard to her requirements of these drugs in the cure and prevention, as far as possible, of the diseases prevalent among livestock in the country.

Animal Health Information Service

Animal Health Information Service, which was initiated by the Council in 1947 with the object of providing latest information to the States and other countries regarding prevalence of important diseases of cattle, horses, sheep, goats and dogs continued to function. This information is compiled in the form of monthly bulletins from statistics supplied by the District Veterinary Officers under different heads such as incidence, location, number of animals attacked and mortality from contagious diseases. These bulletins were being regularly issued free of cost to all the Directors of Veterinary Services and Animal Husbandry Departments, the Principals of Veterinary Colleges, and the heads of Central and State Research Institutes in India. In addition these were also being sent to many Consular Departments of foreign countries. So far 67 such bulletins had been issued.

Dairying

Enquiry into fats, solids-not-fat and specific gravity of milk

In order to help fixing presumptive standards for controlling the quality of milk, schemes to collect necessary data relating to fats, solids-not-fat and specific gravity of milk were sanctioned in Bombay, Bihar, the Punjab, and West Bengal. It was considered necessary to fix these standards on a State-wise basis, in view of the separate State legislations that might come into force. Detailed instructions were circulated on the plan of sampling for the collection of milk samples for these schemes.

The scheme in the Punjab started in August 1949 and terminated in March 1952. The results indicated that buffaloe milk had higher specific gravity and fat and solids-not-fat percentage in comparison to cow's milk. In the detailed study only one lactation data could be analysed. In all 125 animals were selected and 819 samples of buffalo milk and 556 samples of cow milk were analysed and the following results obtained :—

	Specific gravity	Water percentage	Fat percentage	Total percentage	Solids-not-fat percentage	Ash percentage	Protein percentage	Lactose percentage	Freezing Point
Buffalo milk	1·0307	82·94	7·15	17·06	9·91	0·797	4·32	4·798	—0·552
Cow milk	1·0302	86·26	4·57	13·74	9·17	0·715	3·62	4·835	—0·549

The scheme in Bihar started on February 1, 1951. For the study of complete lactation 732 milk samples, morning and evening, were taken from 70 cows, which calved at the Government Cattle Farm during the year, and were analysed. The following results were obtained :—

No. of samples	Fat percentage	Solids-not-fat percentage	Total solids percentage	Density
732	4·4	9·12	13·48	1·0302

During the year under review 2,957 milk samples, both from cows and buffaloes at different stages of lactation, were collected and tested for fat, solids-not-fat and density. The samples were collected at random from Patna town and suburbs, neighbouring villages and Sonepur Cattle Fair from different breeds of animals. Samples from the Patna City Goshala and Rajendra Gokul Sadaquate Ashram were collected fortnightly. On analysis the following results were obtained :—

Number of samples	Fat percentage	Solids-not-fat percentage	Total Solids percentage	Density
Cows 1966	4·4	8·74	13·12	1·0286
Buffaloes .. 991	6·3	9·05	15·32	1·0283

The scheme started in West Bengal in December, 1951. A total of 303 samples were analysed and the following results were obtained in a rapid survey :—

Number of samples	Fat percentage	Solids-not-fat percentage	Specific gravity
Cows 106	4·65	9·21	1·031
Baffaloes .. 197	7·34	10·00	1·032

Combined Bacteriological Scheme, Indian Dairy Research Institute

Heat resistant flora. A scheme for carrying out comprehensive investigations on the incidence and distribution of heat resistant micro-flora in milk produced under different conditions in Bangalore, Bombay and Mathura, was sanctioned in 1950. The scheme was started in April 1951 and experiments were in progress. Together with these investigations the preparation of desiccated cultures of starter organisms and microbiological deterioration of Indian butters were also under study.

A total number of 545 samples of milk including 260 at Bangalore, 123 at Bombay and 162 at Mathura, representing different categories of production during winter and summer, were examined for the heat resistant flora count. The average total bacterial and thermoduric counts (per millilitre of milk) for these samples ranged from 14,320 to 7,269,400 and from 350 to 387,080 respectively in winter and from 8,910 to 18,547,500 and from 80 to 1,449,400 respectively in summer. About 2,500 heat resistant organisms were isolated from these samples and after preliminary screening tests some

300 cultures were selected for detailed studies to be carried out during the second year.

Microbiological deterioration of butter in India. About 75 samples of butter from selected centres in Mysore State, Tirupur (Madras), Bombay and Mathura (U.P.) were examined for their total bacterial content and yeast and mould counts. On the basis of mould mycelia counts 16 per cent of the samples were found to be of poor quality. The average yeast and mould counts (per millilitre) were from 40,670 to 1,827,920 yeasts and from 29,330 to 460,080 moulds in the case of *desi* butter, and 6,710 yeasts and 38,330 moulds for creamery butter. About 375 isolates (including yeasts, moulds and bacteria) were obtained from the above samples and they would be examined in detail during the second year.

Preparation of desiccated starter cultures for dahi, *butter and cheese.* Preliminary trials on the conditions influencing the growth of seven species of lactic acid bacteria in relation to their ability to withstand desiccation were in progress. Laboratory trials were carried out on the freeze-drying of some single, as well as mixed cultures and viability studies on these desiccated cultures were undertaken. Some of the dried cultures were found to remain viable for over nine months at room temperature and proved satisfactory for curdling milk.

Bacteriological quality of market milk

A scheme was started at Bangalore and Lucknow and later at Calcutta in order to collect information relating to the bacterial quality of market milk produced and handled under different climatic and seasonal conditions, as also in respect of various methods of transport and utensils used. The work at the first two centres had since terminated.

During the course of the experiment at Calcutta some 1,600 samples from various sources representing organised dairy farm, farm produced milk exposed to village conditions of transport, village produced milk and other minor sources of milk supply to the urban consumers were collected and analysed.

From the results it was apparent that the number of bacteria increased tremendously during transport mainly due to the improperly sterilised containers and unhygienic methods of handling. Milk delivered in bottles showed lower counts. The season also influenced the keeping quality of milk. The number of bacteria increased during the rains.

Most of the transporting vessels were without lids and generally found to be stuffed with straw and leaves. In some villages, milk was produced in a reasonably clean manner. At the time of production, the count was from 35,000 to 1,200,000 per millilitre but during transport due to heavy contamination and lack of sanitary precautions, the bacterial count reached 1,260,000,000 to 2,400,000,000 per millilitre in summer and in monsoon. If proper precautions were taken, the count could be kept considerably low.

Technique of manufacture of market quality of ghee

During the year nine out of twelve monthly trials showed that the prestratification method conducted in the newly designed ghee boiler offered a distinct advantage over the traditional method of direct clarification in *karahi*

over open *chulha* for the conversion of butter into *pucca ghee*. The advantages were economy of fuel, saving in time, improvement in the hygienic standard, and possibility of slight increase in yield and the flavour of the prestratified *ghee* was found to be better than the directly clarified *ghee* and its moisture content was less.

Preservation of raw butter

Two methods of preservation of raw butter were tried, *i.e.*, ' starch paste in saline ' and ' starch paste in water '. It was found that development of acidity upto a certain stage could not be checked, preservation in either case by 'starch paste in saline ' prevented moulds from growing, and *ghee* manufactured from butter preserved with ' starch paste in saline ' was superior.

Standardising methods for the analysis of ghee

A few tentative methods for *ghee* analysis recommended by the Dairy Science Committee were tried at seven different centres in various parts of the country. Samples of *ghee* were prepared from milk at the Indian Dairy Research Institute and supplied to all the participating laboratories. The results obtained are given below :

Per-oxide value, which is a measure of rancidity of *ghee* prepared under proper conditions, was low. Tentatively an upper limit of 2·0 might be prescribed for market samples.

By acetone-alcohol solubility test the presence of even 5 per cent of animal body fats added to *ghee* could be detected. The utility of this test was, however, limited by the fact that *ghee* obtained from animals fed cotton seeds also gave a positive reaction.

There was no significant correlation between Reichert and Polenske values. The values by themselves were of considerable importance in the analysis of *ghee*, Reichert value for detecting the presence of vegetable and animal fats and Polenske value for detecting adulteration with coconut oil. There was a significant negative correlation between Reichert and Iodine values and the latter could therefore be used to confirm the results of Reichert value determination. Linoleic acid content of *ghee* increased, when *ghee* was adulterated with *vanaspati*. However, the increase was not so outstanding as to permit the use of the method for detecting adulteration in *ghee*. Refractive dispersion of *ghee*, determined by using Pulfrich refractometer in the ultra-violet region did not show any special advantage over the much simpler refractive index determination for detecting purity of *ghee*. Phytosteryl acetate was found to be the most sensitive and reliable test for detecting the presence of *vanaspati* in *ghee*. Adulteration with even 5 per cent could be detected without any ambiguity.

The results for the determination of the conversion factor for converting blue units into international units of vitamin A were inconclusive.

The titre values of Kathiawar *ghee* samples were found to vary from 40·1 to 47·6 per cent. Nearly 69 per cent of the samples had titre values below 43·5. There was no indication that the titre value varied with the season.

Method for analysis of milk and its products

A few standard methods of analysis of milk and its products, recommended by a special committee appointed by the Indian Council of Agricultural Research for the purpose, were tried at five centres, *viz.*, (i) Indian Dairy Research Institute, Bangalore, (ii) All India Institute of Hygiene and Public Health, Calcutta, (iii) Allahabad Agricultural Institute, Allahabad, (iv) Aarey Colony, Bombay and (v) the Veterinary College, Patna. The scheme also aimed at laying down suitable standards for different interpretation of results on sediment test of Indian milk and to define standards for different qualities of milk on the basis of the sediment test. Work at four centres was completed. The Director, Dairy Research would consolidate the results achieved from all the centres.

Hides and Skins

Damage caused by biological factors

A scheme has been in force since 1942 at the Indian Veterinary Research Institute with the objects of recording observations on the geographical distribution, seasonal occurrence, bionomics, incidence and nature of damage caused by various species of ticks and allied parasites in their different stages of life histories to hides and skins in India and studying both under laboratory and field conditions the most suitable methods for the control of these parasites. The headquarters of the scheme was transferred during the year from Mukteswar to Izatnagar. Large consignments of raw and cured hides and skins were examined in Uttar Pradesh. Systematic examination of collected specimens of ticks revealed that on an average 50 to 60 per cent of the hides had tick marks which might cause a depreciation in prices from 25 to 30 per cent ; tick marks were most abundant on the belly, and the damage was mostly caused by the two ticks *H. acgyptium* and *Boophilus microplus* in the adult stage. Histo-pathological changes caused by the tick bite on the cellular structure of the hides and skins were also studied. Trials were continued to assess the tickicidal value and toxic properties of the imported and indigenously manufactured acaricidal drugs, such as Hexidole (1950), Torch Brand Kitkari AP/5045, DDT, and Hexyclan. One lb. of Hexidole in four gallons of water had the maximum tickicidal effect, which remained till the sixth day of its application. A maximum tick mortality of 98 per cent was obtained on the seventh day of the application of Kitkari AP/5045 in its highest concentration. The residual effect or the duration of period for which the animals remained free of ticks was seven days. It was also concluded that DDT, as a successful tickicidal agent, should be in a fine state of dispersion and dissolved in a suitable organic solvent. Preliminary results achieved with Hexyclan were highly satisfactory, almost cent per cent mortality among cattle ticks was recorded on the sixth day of its application. The duration of the period over which the animal could be protected from reinfestation was 10 to 12 days.

Life history and bionomics of goat warble fly Hypoderma crossi *Pattan*

The traders in hides and skins in Calcutta reported that Bihar and West Bengal were badly infested with goat warble fly and more than 50 per cent of

the goat skins, that were sent from these two States to Calcutta for export, were found to be warble damaged. Taking into consideration the economic loss to the country, an enquiry was initiated into the life history and bionomics of goat warble fly pest with a view to its control and eradication. The governments of Bihar and West Bengal were requested to undertake a rapid survey of the affected areas and collect materials and to forward them to the Director, Indian Veterinary Research Institute, Izatnagar, which would be the headquarters of the scheme.

Research on leather technology

The following four schemes were sanctioned by the Council for a period of three years with effect from April, 1953 at the Central Leather Research Institute, Madras :—

(i) Research to improve the quality of shoe upper and industrial leather manufactured by mineral tannages

(ii) Research for the manufacture of fat liquor for leather production from Indian hides and skins from indigenous raw materials to make the Indian tanning industry self-contained for these essential products

(iii) Research on the manufacture of chrome retan leather from cow hides of a suitable thickness for the manufacture of heavy boots required for the army, police, and other purposes in which a thick pliable leather was needed

(iv) Research on the manufacture of leather boards from leather shavings and cuttings, which were the waste-products of tanneries, with a view to help the primary producers to get better value for their products

Apiculture

Regional bee research stations

The Council set up two Regional bee research stations one at Coimbatore in the South and the other at Katrain in the North. Regional bee Research Station, Coimbatore was started in December 1951. One of the objects was to investigate the possibilities of improving the honey gathering capacity of *Apis indica* Fabre, the Indian honey bee. Colony Number 41 was selected on the basis of its performances in the past years and observations were made to find out the possibility of rearing pedigree queens. The study of nectar yield and composition of tamarind, mimusops and plantain was in progress. The weather conditions on the days of collection of nectar were also recorded with a view to study their effects on the secretion and concentration of nectar. The weight of pollen brought by a bee per trip varied from 0·0063 gm. in coconut to 0·0173 gm. in irrigated cholam. Nine new bee pasturage plants were also recorded. Workers of *Apis indica* F. from plains and hills were collected for taxonomical studies and preliminary studies were made. Honey from *Glyricidia*, cotton and *neem* were collected and analysed. A few samples of the predatory bugs were also collected and studied under the laboratory conditions ; these were found to thrive on drones as well as on caterpillars of *C. cophalonica*. Different

mixtures of soyabean, groundnut kernel, yeast and jaggery as pollen substitutes were fed to the bees. Bees were noticed for the first time to accept these substitutes in very small quantities.

At the Regional Bee Research Station, Katrain strains of bees were selected, which yielded an average of 12 lb. 1 oz. honey per hive as against 7 lb. 2·6 oz. for other unselected hives. The workers were found to start foraging at the age of about 15 to 18 days and to have a life span of 50 to 58 days in the busy season from May to July. Observations on swarming of bees were recorded. The yellow of an egg with honey was found to be the best artificial feed and colonies fed on artificial feed gave 30 per cent more yield. Influence of bees on pollination was studied and it was found to depend on the crops or fruits under study. Study of bee pasturage showed that during the winter and spring there was enough feed to allow extensive broad rearing and swarming with no surplus for extraction. A study of bee enemies and insecticides was made. It was noted that Gammexene dust 120 and Ostico band hand were more effective in checking the attack of black ants than Agrocide 520 and DDT 550,10. The studies on the composition of the Punjab honey were made and it was found to compare well with samples from abroad.

Fish and Fisheries

Research on control of animal pests of stored fish

The scheme of research on the control of animal pests of stored fish, which was initiated in April, 1949 in Travancore University, was terminated in April, 1952. Under this scheme the survey of the various pests associated with stored fish was conducted, their life histories studied, method of infestation and factors responsible for infestation explored, and different possibilities of controlling and preventing them were found out. A number of fish godowns were examined and samples of dried fish and prawns from such places as Cape Comorin, Quilon, etc., were collected. Insects and mites, which caused damage to dried fish and prawns, were collected during the survey and their life histories studied. Of the 12 forms of insects and mites, which infested dried fish and prawns, two *Dermestes ater* De Geer and *Lardoglyphus hughesi sp.* nov. were found to be the most common and serious. Studies on the incidence of pests in relation to different types of godowns, showed that the number of pests was least in well constructed godowns with brick walls and cement floor. In addition, control measures such as mechanical destruction, sifting, sun drying and preventive measures, such as pretreatment, air-light sealing paper, packing, etc., for controlling the damage caused by insects and mites were studied and put into practice.

Piscicultural Research Scheme, Annamalai University

With a view to carry out the investigations into the seasonal cycles in the gonads and the reproductive cycles of *Ophicephalus striatus*, *Cirrhina cirrhosa*, *Cirrhina reba*, *Labeo fimbriatus* and *Chanos chanos* and to study the evaluation of the factors that might be involved in the onset and termination of annual sexual cycles of the fishes, a scheme was put into operation in August, 1951, in Annamalai University. During the period the investigation concerning the seasonal variations in gonads and the reproductive cycles of *Ophicephalus striatus*, *Cirrhina reba* and *Labeo fimbriatus* were carried out. Data in

connection with the seasonal variations of the condition factor of the *gonads* were found to be correlated with histological changes in the testes and ovaries of *Ophicephalus striatus*, *Cirrhina reba* and *Labeo fimbriatus*. These changes were also correlated with the size and histology of the pituitary glands of *Cirrhina reba* and *Labeo fimbriatus*. The human gonadotrophin was prepared from human pregnancy urine and its effect on the ovary of *Ophicephalus striatus* was investigated.

Other Items

Research fellowships

Recognising the general paucity of qualified persons in the various branches of animal husbandry, the Council instituted in 1951 a number of fellowships, each of two years duration for training in animal pathology, animal bacteriology, animal physiology, animal parasitology and animal genetics at the Indian Veterinary Research Institute. Four of the scholars selected in the first series joined during 1951-52. The fifth scholar in animal pathology joined the Institute during 1952-53.

Candidates for the second series of fellowships in animal pathology, animal bacteriology, animal physiology, veterinary protozoology, and veterinary entomology were selected during the year. The scholar selected in animal physiology joined the Central Drug Research Institute, Lucknow, in March, 1953 for receiving training in veterinary pharmaecology. The remaining four are expected to join the Indian Veterinary Research Institute shortly.

A fellowship in dairy bacteriology was also instituted this year. A candidate was selected and he was expected to join the Indian Dairy Research Institute at Bangalore shortly for receiving the training.

CHAPTER IV

AGRICULTURAL AND ANIMAL HUSBANDRY RESEARCH

DURING the year the Council obtained the services of Dr R. O. Whyte, an F.A.O. expert on pasture land management. He undertook the compilation work of a hand book on pasture grasses and fodders. The compilation would contain a review of the past work done and detailed suggestions for future development. A co-ordinated scheme for pasture land improvement was prepared by him. The scheme as finally approved contained three parts :

Part I. Grass land survey both within and outside the Reserved Forests, to be undertaken by a central team. The survey is expected to be started in September, 1954.

Part II. (*a*) Research on grassland management. Due to the difficulties under Indian conditions, this work would be restricted to the Community Project Areas, where some degree of control might be exercised.

(*b*) Research on fodder production. This work might be undertaken in all States. Those States, which would like to take up the work and desire financial assistance would have to apply to the Council at an early date so that the work might be started in 1954-55.

Part III. Breeding. This work would be confined to two centres (i) Indian Agricultural Research Institute and (ii) Dharwar in Bombay. The scheme had already been sanctioned by the Council. Work at the Indian Agricultural Research Institute had been started recently, while at Dharwar it would start from 1st April, 1953.

The Animal Husbandry Wing of the Board of Agriculture and Animal Husbandry, at its Poona meeting held in March, 1953, also considered the steps to be taken for pasture improvement and recommended among other things the establishment of Agrostological Sections in the States, the revival of the Fodder and Grazing Committees, the introduction of leguminous fodders in crop rotation, the use of fodder producing grasses in the soil conservation programme, etc.

The scheme on *kudzu* vine at the Indian Agricultural Research Institute was in its last year of working. To the three collections from the U.S.A., Australia and Travancore, a fourth from Assam was added. Studies on the first three collections further confirmed the unsuitability of tropical *kudzu* for sub-tropical conditions of northern India (Delhi). The Assam variety, on the other hand, proved to be cold-resistant and remained green throughout winter, although the growth was very much retarded. This winter hardiness in the Assam variety might prove interesting for a breeding programme in combining winter hardiness quality with the far better growth character in the U. S. varieties. Flowering was not observed in any of the varieties. Propagation by planting of crowns in pots gave 90 per cent establishment as against 50 per cent with planting in fields. Nearly 1,500 crowns were supplied by the Indian Agricultural Research Institute to private individuals and

government farms in 17 different States. A scheme for the propagation and distribution of *kudzu* vine was started in Cuddapah (Madras). Reports were encouraging.

A new scheme was sanctioned at the Indian Agricultural Research Institute and Indian Veterinary Research Institute for trials with a standard herbage incubator to explore the possibilities of supplying green fodder to cattle on a small scale and to work out the economics of the operation of the incubator.

CHAPTER V

STATISTICAL RESEARCH

THE Statistical Branch of the Council continued its advisory work relating to the designing of agricultural and animal husbandry experiments and the interpretation of their results, the examination of technical programmes and annual reports of the Council's schemes and the scrutiny of statistical papers received for publication in the Council's journals. A number of statistical enquiries received from the Food and Agriculture Organization of the United Nations, Central Government, State Governments and other institutions were also dealt with.

Survey of agronomic programmes

A survey of agronomic research for the year 1952-53 was in progress to obtain a quick integrated picture of the current agronomic research work done in the whole country. The survey was restricted to field experiments pertaining to agronomic practices such as rates, types and levels of fertilizer application, methods of cultivation, seed rates and spacing; irrigation schedules, mixed crops, rotation of crops, etc.

Survey of agronomic experiments (1952-53)

A committee on model agronomic experiments was set up to prepare a plan for agronomic experiments, which would be conducted in the different parts of the country on a co-ordinated basis. In order to avoid duplication and consequent waste of efforts in the planning of these experiments, all available information on experimental work carried out in the past on agronomic practices would be collected by means of a comprehensive questionnaire. A brief review of the work done on agronomic practices during the last 17 years would be prepared on the basis of returns of this survey and other published records available on agronomic research in the country.

Fertilizer experiments

The planning of experiments under the U. S. A. Technical Co-operation Administration on the use of fertilizers was taken up during the year under report on paddy and wheat. These experiments consist of two types:

(*a*) *Simple trials on cultivators' fields.* These trials would be conducted in the Community Project Areas. To begin with, trials on cultivators' fields would be carried out in one development block of 100 villages. Each trial would consist of 5 or 6 plots. The effects of the following factors would be studied:

(i) Levels of types of nitrogen

(ii) Types of nitrogen and effect of phosphate

(iii) Types of phosphates and effect of nitrogen

(iv) Types and levels of phosphates and effect of nitrogen.

Since much information was not available about fertilizer responses under conditions of cultivators' fields, these experiments were being planned to obtain reliable information.

(*b*) *Complex experiments.* Complex experiments would be carried out at different 15 acre centres in the non-Community Project Areas representing different soil and climatic conditions. In the suggested scheme of experiments the effects of following factors would be studied :

(i) Levels and types of nitrogen

(ii) Times of application for different types of nitrogen

(iii) Minor elements and potash

(iv) Fertilizer placement

(v) Residual values of phosphate

(vi) Water supply and levels of nitrogen and phosphate

(vii) Varieties and levels of nitrogen and phosphate

Crop cutting surveys

Sample surveys for the estimation of yield of principal food crops were continued in all part 'A' States (excluding Bengal), Part 'B' States of Hyderabad, Mysore, PEPSU and Rajasthan and Part 'C' States of Ajmer Bhopal, Coorg, Delhi and Vindhya Pradesh. One more State, *viz.*, Himachal Pradesh, was brought under the purview of the surveys during the year under report. The Crop Survey Scheme in Orissa was continued, but on a reduced scale in the same eight districts, which were covered in 1950-51.

The official forecasts of production of food crops in several States was now based on the results of sample surveys.

'Grow More Food' campaign

'Grow More Food' assessment surveys were continued in Assam, Bihar Bombay, Madras, Madhya Pradesh, Orissa and Madhya Bharat and extended to the Punjab and Bhopal during the year.

The Central Supervisory Check, proposed under the five year co-ordinated scheme, was instituted during the year and statistical supervisors were sent out to different States to exercise spot check on the collection of the primary statistics of area and yield. They carried out inspection of the field work relating to crop estimation surveys and 'Grow More Food' assessment surveys and reported on the accuracy of village records relating to crop acreages maintained by the *patwaris.*

The services of the supervisors were also utilised in conducting a sample check of minor irrigation wells constructed under the 'Grow More Food' campaign. An interim report thereon was submitted to the 'Grow More Food' Enquiry Committee.

A preliminary enquiry in connection with the sample survey of cultivators' holdings under the World Agriculture Census Programme of the F.A.O., was organised under the technical guidance of the Council in States at the instance of the Government of India. Field work as well as statistical analysis of the data obtained in the enquiry was in progress.

In accordance with the decision of the Government of India, the work relating to the five year co-ordinated scheme of crop-cutting experiments on principal food crops and the 'Grow More Food' assessment surveys, which was hitherto done by the Council, was transferred to the administrative control and technical supervision of the Department of Economic Affairs with effect from January 1, 1953.

Estimates of production of non-food crops

(*a*) *Jute.* Crop-cutting surveys were carried out on jute in Assam and Orissa during 1952-53. The object of these surveys was to obtain reliable estimates of total production of jute in these States. The results of the analysis showed that the estimates of average yield of the crop were obtained with a precision of about 3 per cent in the case of Assam and 5 per cent in the case of Orissa.

(*b*) *Oilseeds.* In 1951-52, pilot surveys for the estimation of production of oilseed crops were initiated on castor and *til*, Statewide surveys on groundnut in Madras, linseed in Madhya Pradesh, and rape seed and mustard in Uttar Pradesh. The pilot surveys in the last two States were repeated during the year under report for the purpose of collecting further information on the various aspects relevant to the planning of large scale sample surveys. The field work was completed and the statistical analysis of the data remained to be done.

Improvement of livestock and fishery statistics

A five year scheme for the improvement of statistics relating to livestock and fisheries was sanctioned by the Government of India. The scheme was a sequel to (i) a pilot survey for estimating the total catch of marine fish, which was conducted in the South Coast of Malabar in 1950-51, and another (ii) for evolving a rationalised programme of supervision for improving the reliability of livestock numbers collected normally in the quinquennial census carried out in Etawah District of Uttar Pradesh. The marine fisheries survey was carried out on the 300 mile coastal strip of the Madras south-east coast in November, 1952 for a period of seven months and the livestock survey was conducted in the Wardha district of Madhya Pradesh during January and February, 1953. The statistical analysis of the data collected was in progress.

Cost of production of cotton and rotation crops

The scheme for estimating the cost of production of cotton and other crops grown in rotation with it was initiated in Akola district of Madhya Pradesh in May, 1952, the district being a typical cotton growing area. The object of the scheme was to estimate the amount of bullock and human labour and materials required for the production of the particular crops. A sample of 30 villages was selected for the purpose of the enquiry and field and supervisory staff stationed appropriately. The field staff submitted fortnightly returns giving details of operations on the selected fields and expenditure on cattle in selected holdings for a period of one full year. The returns obtained were being scrutinised and the statistical analysis of the results was in progress.

Cost of production of milk

A preliminary procedural enquiry for ascertaining the relative importance of different items affecting the cost of production of milk and for obtaining an idea of the order of variation involved so as to help in planning the full scale enquiry, was conducted both in the urban and rural areas of Delhi. The data collected were analysed statistically and the report of the examination of the results, as well as the plan for the large scale enquiry in the Delhi State was prepared. The results indicated that the cost of food formed the major part of the total cost, constituting about 70 per cent of it, both in the urban stables and rural stables of the cultivators. In the case of non-cultivator milk producers, however, the feed cost amounted to 50 per cent of the total cost, the reason for the lower value being that the most of the fodder was collected free of charge by the available surplus man power. The statistical analysis indicated that about 50 stables in the urban area and 100 stables in the rural area might be taken up for investigation in the larger enquiry in order that the average cost of milk per seer might be estimated with a margin of error of less than one anna. The large scale enquiry is to be conducted for a period of two years and a quarter beginning from July, 1953, so as to cover at least one calving interval and also all the seasons. The object of this scheme was to make a critical statistical study of the data collected at the Indian Diary Research Institute, Bangalore and Livestock Research Station, Hissar, so as to provide quantitative evaluation of the various aspects of the breeding programmes.

The data collected at Bangalore relate to Sindhi, Gir and cross-bred cattle, while those at Hissar pertain to Sindhi and Kangayam breeds of cattle. The data pertaining to the Sindhi breed at Bangalore was taken up first for analysis. A number of aspects were examined, the more important of which were the effect of the order of lactation on lactation-yield, length of lactation and average daily milk yield, generationwise dam-daughter comparisions for each of the first four lactations for the five variates, *viz.*, lactation length, lactation yield, average yield (both per day of lactation and per day of calving interval), and lactation yield adjusted for the number of days in milk, correlation of yields between paternal and maternal half-sisters, the progeny testing of bulls and the estimation of their sire indices and the potentiality for improvement through selection among the dams of each generation.

Statistical analysis of the data collected in the sheep improvement schemes

The voluminous data collected in the two sheep improvement schemes run by the Council at Hissar and Mysore, were critically examined by subjecting them to statistical analysis. The reports were under preparation.

Sampling of wool for measurement of quality

The scheme for evolving a suitable method of sampling wool from fleece and commercial bulk for a study of the attributes of length, fineness and medullation of wool fibres was continued. The measurement of the length of fibres of 144 samples from the fleece of each of twelve sheep was completed and the data were being statistically analysed. The data pertaining to the length of fibre of commercial bulk samples were collected. The measurement of the other two attributes of wool quality, *viz.*, fineness and medullation, was in progress.

Training and research

The Applicational and Diploma Courses in Agricultural Statistics were continued during the year 1952-53. Twenty-nine students were admitted to the Applicational Course and seven to the Diploma Course. Nine candidates were deputed by the State Governments and other recognised institutions. Two officers from Afghanistan, two from Liberia and one from Finland were deputed for training under the Fellowship Programme of the Food and Agriculture Organization of the United Nations. Twenty candidates passed the one year Applicational Course Examination held in 1952. Four students were declared successful in the Diploma Course Examination. Fourteen candidates appeared in the Admission Test for the Diploma Course (Statistical Theory) and eight were declared successful.

Special training in field work relating to crop cutting experiments and area sampling was given to the students for over a fortnight in the villages under the Delhi Development Scheme of the Council. Students of the training courses were taken as usual to the Indian Agricultural Research Institute to study the problems in practical agriculture in the various Divisions of the Institute. The students also paid visits to some centres of research in agriculture and animal husbandry in the country.

Two research fellowships were awarded to carry on advanced research in agricultural and animal husbandry statistics. The problems investigated were in field of inheritance of quantitative characters and on the utilisation of information from previous surveys in the planning and analysis of a sample survey. Some useful and interesting results were obtained.

Research papers and notes

A number of technical papers were prepared by the staff of the Council during 1952-53. Some of the important papers are given below :

1. Trend in Areas and Yields of Principal Crops in India by Dr V. G. Panse
2. Fixing Standards of Quality for Market Milk by Dr V. G. Panse and Shri V. N. Amble
3. Non-sampling Errors in Surveys by Dr G. R. Seth and Dr P. V. Sukhatme
4. Sequential Sufficient Statistics by Dr R. R. Bahadur
5. Impartial Decision Rules and Sufficient Statistics by Dr R. R. Bahadur and Mr. L. A. Goodman

Other Items

Statistical Conference

A conference of Agricultural Statisticians and other technical officers in the States and at the Centre was held at New Delhi in February, 1953. The conference discussed problems relating to the planning of agricultural research, preparation of research programmes, designing of experiments, and stressed the need for proper facilities for statistical work in agricultural research programmes in the States and research institutes and for training in Agricultural Statistics. The analysis, interpretation and reporting of results of experimental data also received attention. Two F.A.O. Statistical Experts, Dr F. Yates and Dr D. J. Finney, participated in the deliberations of the conference.

Statistical Experts

Dr F. Yates, Head of the Statistics Department of the Rothamsted Experimental Station and Dr D. J. Finney of the Oxford University were assigned to the Indian Council of Agricultural Research as Statistical Experts under the Expanded Technical Assistance Programme of the F. A. O. to advise and assist the Council in its research and training activities. Dr Yates joined the Council in January, 1953 and remained in India for about two months. Dr Finney joined in September, 1952 and was associated with the Council for a period of about one year. He advised on the statistical aspects of the research schemes of the Council mainly on the agricultural side, participated in the teaching programme of its training course in Agricultural Statistics by giving special courses of lectures and also delivered seminar talks. Dr Yates and Dr Finney examined the research and training programmes of the Statistical Branch of the Council and made recommendations for the expansion of its activities.

Professor Jerzey Neyman of the University of California paid a visit to the Statistical Branch of the Council in the first week of December, 1952, and discussed with the members of the staff the various statistical problems engaging their attention.

Deputation of Officers

The services of Dr G. R. Seth, Professor of Statistics were placed at the disposal of the F. A. O. for technical advice to the Far Eastern Demonstration Centre at Bangkok for agricultural statistical sampling for a period of six months. Dr Seth also participated on behalf of F. A. O. in a seminar on 'Production and Prices' held at Beirut in the Middle East in July, 1952. Dr V. G. Panse, Statistical Adviser of the Council, Dr G. R. Seth, Professor of Statistics and Shri V. N. Amble, Assistant Statistician participated in the training activities of the undermentioned teaching centres sponsored by the various international bodies :

(i) Training Centre in Fishery Statistics at Bangkok organised under the joint auspices of the F. A. O. and the Indo-Pacific Fisheries Council

(ii) Far Eastern Demonstration Centre at Bangkok for agricultural statistical sampling organised by the F.A.O.

(iii) International Training Centre in Soil fertility at Coimbatore conducted under the auspices of the F.A.O.

(iv) F.A.O. Training Course in Plant Breeding, Cuttack

Shri V. R. Rao, Assistant Statistical Adviser of the Council, proceeded to the U. S. A. for study in agricultural statistics under the Point Four Programme.

CHAPTER VI
EXTENSION SERVICE

FIFTEEN Pilot Development Projects, which were sanctioned last year in the States of Bombay, Madhya Pradesh, Mysore, Bengal, Uttar Pradesh, Assam, Bihar, Orissa, Himachal Pradesh, PEPSU, Hyderabad, Madhya Bharat Bhopal, Vindhya Pradesh and Travancore-Cochin, subsidised by the Ford Foundation under the agreement signed between the Government of India and the Ford Foundation authorities, functioned quite satisfactorily. These projects were helping a good deal to ameliorate the plight of the rural masses through multipurpose village level workers. The extension workers demonstrated the results of research in agriculture, health, education and social organisation and the rural population was assisted in adopting the improved practices. A statement showing the location, date of start and budget estimates, etc., of the various Pilot Development Projects in the country is given in Appendix XVII.

Extension Training Centres

Thirty-four training centres, set up with financial assistance from the Ford Foundation and Technical Co-operation Administration were located in the State of Bombay, Madhya Pradesh, Mysore, Bengal, Uttar Pradesh, Assam, Bihar, Orissa, Himachal Pradesh, PEPSU, Hyderabad, Madhya Bharat, Bhopal, Vindhya Pradesh, Travancore-Cochin, Punjab, Rajasthan and Saurashtra. Five training centres established in the first five States mentioned above were located along with the Pilot Development Projects in those States. These were for a period of three years and their cost was exclusively met by the Ford Foundation. The other 29 centres were for a period of four years. One of the centres located in the Punjab at Nilokheri was being run under the direct administrative control of the Government of India, Indian Council of Agricultural Research. These training centres were set up to train key extenstion personnel, *i.e.*, supervisory staff and village level workers required to man the Ford Foundation Pilot Development Projects, Community Projects, as well as the National Extension Service blocks. To ensure facilities for practical work to be done by the trainees with their own hands, all these training centres were located either within a Pilot Development Project area or near about them. Twenty-nine training centres started functioning upto March, 1953. Five hundred and eighty men were trained, and 1,914 were under training. The number of personnel trained have been shown centrewise in Appendix XVIII.

Land Army

The campaign for recruitment to the Land Army was initiated by the President in June, 1952 in Delhi with a view to utilising the considerable enthusiasm in the country among officials, students, teachers and rural people for collective work. Land Army units were formed in Delhi, Bombay, Bengal, Assam, Bhopal, Vindhya Pradesh, Ajmer and Orissa. These units were doing useful work in implementing specific agricultural programmes chalked out.

Crop Competitions

During 1951-52 competitions were organised for six crops, *viz.*, paddy, wheat, potatoes, gram, *jowar*, and *bajra*. Twenty-two States participated in it.

The number of competitors was 171,068 and the area under competition was 121,636 acres. The Government of India had announced a cash prize of Rs. 5,000 and a certificate of *Krishi Pandit* each to the successful competitor. The names of prize winners and their yields, etc., are given below :

Crop	State winning the award	Name of the prize winner	Yield obtained		
			Md.	Sr.	Ch.
Paddy	Coorg	Shri J. C. Sangayya	136	5	14 (dry)
Wheat	Punjab	Shri Gurdeb Singh	71	23	10
Potatoes	U. P.	Shri Jai Pal Chandra	735	24	0
Gram	Punjab	Shri Wilaiti Ram Lambardar	46	2	6
Jowar	Bombay	Shri B. D. Patil	84	23	5
Bajra	Bombay	Shri V. R. C. Marathe	29	11	10

During the year 1952-53, crop competition fortnights were organized in different States during the months of June and December, 1952, *i.e.*, before the *kharif* and *rabi* sowings to enlist the maximum number of competitors in the six crops mentioned above.

It was proposed that in addition to the present all-India prizes awarded to the cultivators, who got the highest yield in the selected crops, there should be community prizes for the best village, *tehsil*, district and State, judged according to certain standards in confirmity with the Crop Competition Rules. The proposed prizes would be utilised for the benefit of the particular village, *tehsil*, district, etc., as a whole. The proposal is under the consideration of the Government of India.

To ensure that all-India Crop Competition prizes and certificates of *Krishi Pandits* were awarded on the basis of correct yields, it was decided that the farmers, who stood out in State competitions, should compete among themselves in the next corresponding season for the all-India Crop Competition award, so that such final competitions might be of a manageable size and adequate supervision might be exercised. This decision would become effective from the all-India awards for the year 1952-53

Other Items

Appointment of Deputy and Joint Directors

Deputy and Joint Directors of Extension were appointed overall in-charge of extension work in the States of Assam, Bombay, Bengal, Bihar, Madras, Madhya Pradesh, Orissa, Uttar Pradesh, Hyderabad, Mysore, PEPSU Rajasthan, Saurashtra, Ajmer, Bhopal, Coorg, Delhi, Himachal Pradesh, Kutch and Tripura. The appointment of such officers in the remaining States was still under consideration.

Delegation to U. S. and Japan

A delegation consisting of Senior Extension Officers in the States and Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, went to the U. S. A. and Japan in the third week of August, 1952 under the leadership of Shri K. R. Damle, Joint Vice-President, Indian Council of Agricultural Research to study extension activities in those countries. The delegation spent about two months in the U. S. A. and about a fortnight in Japan and returned to India in the middle of November, 1952. The study tour was sponsored by the Ford Foundation and the entire cost thereof was met by them.

Japanese method of paddy cultivation

In view of the high yields reported to have been obtained by the adoption of the Japanese method of paddy cultivation and the ease with which it could be applied throughout the country for stepping up rice production, the Government of India decided to launch a countrywide campaign for the promotion of this method during the *kharif* season of 1953.

The Government of India on their part made a grant to meet the cost of material for publicity like leaflets, posters, flannelgraphs, flip-books, film-strips, etc., to be supplied to the State governments for wide distribution. Further, it reduced the price of ammonium sulphate from Rs. 365 to Rs. 290 per ton *ex*-Sindri, so that farmers might be encouraged to make greater use of this fertilizer. Besides, officers-in-charge of the campaign in the States were invited to Delhi to a meeting at which fundamental features of the system and the way they were to be demonstrated to paddy growers were explained to them to enable them to organise work in States on right lines. The campaign was officially launched on March 15, 1953 simultaneously in all States.

Short term refresher courses in agriculture

The Indian Council of Agricultural Research sanctioned five schemes for initiating short term refresher courses in agriculture for the benefit of young farmers in order to acquaint them with recent developments in agricultural production, so that they could utilize the knowledge gained in developing their own lands. These courses would be conducted at the existing agricultural colleges or schools.

Establishing closer contact between the research stations and extension workers

In order to establish closer contact between research stations and the extension workers, the Council proposed that a number of refresher courses should be arranged at the research stations on agricultural matters and cultural practices concerning the particular commodity or commodities with which the respective research stations were concerned. This would enable the extension staff to understand the latest improvements with regard to a particular cultural practice, as demonstrated at the research station and to transmit them to the farmer thereafter. It would also serve to bring to the notice of the research workers, the practical problems confronting the farmer with regard to particular cultural practices, so that the research stations might try to solve those problems. This, it was considered, would set up a routine, whereby the extension workers would periodically contact research stations to learn the latest improvements and the problems of the farmers requiring solution would be brought to the notice of the research workers.

The Central Rice Research Institute proposed to start refresher courses this year on rice for the benefit of the extension workers of the Orissa Government. The Governments of Madhya Bharat, Ajmer and PEPSU also proposed to follow the lead given by the Central Rice Research Institute.

Establishment of Extension Wings in Agricultural Colleges

To provide practical training in farming and extension work under rural conditions to the under-graduates and post-graduates of Agricultural Colleges, sons of farmers and teachers of primary and secondary schools, it was decided to establish extension departments by certain selected colleges

with financial assistance from the Ford Foundation. The main purpose of establishing these departments of extension was to provide scientific and supervised field training in extension methods and techniques. The trainees would be made to live in the community development centres eight weeks each year and work in the villages. Extension Wings were attached to the following colleges :

1. Agricultural College, Nagpur
2. Agricultural College, Poona
3. State Agricultural College, Tollyganj (Calcutta)

It was proposed to establish similar Extension Wings in two more Agricultural Colleges.

The Agricultural Institute, Naini (Allahabad) was provided with Extension Wing with direct arrangements between the Institute and the Ford Foundation.

Village Rehabilitation Scheme, Baroda

The Village Rehabilitation Scheme, Baroda was started on February 5, 1945 and was jointly financed by the Indian Council of Agricultural Research and by the Government of Bombay. The scheme was undertaken with the object of studying different forms of tenancy and co-operative and collective systems of farming in order to find out the best system from the point of view of national interest and the welfare of the individual cultivator. Four different forms of land tenure and farming, *viz.*, proprietory, leased tenancy, co-operative and collective systems of farming were tried. A number of backward community farmers were rehabilitated on the lands from which they were ousted by the money lenders. The results indicated that on the basis of profit per acre, the proprietory system proved the best, followed in order by the lease tenancy, collective and co-operative systems. The scheme was modified and only two systems of farming, *viz.*, (i) tenancy in perpetus and (ii) collective farming were being tried. The rehabilitation aspect of the scheme was now receiving greater attention.

Agricultural education

The first meeting of the Indian Council of Agricultural Education, which was set up under the aegis of the Indian Council of Agricultural Research last year, was held at Hyderabad in April 1952 (Appendix XIX). The Council suggested the frame-work within which the model syllabus would be evolved. The recommendations were forwarded to the State Governments and Vice-Chancellors for implementation. The replies from the Universities of Mysore, Madras, Calcutta, Rajputana, Banaras, Andhra and from the Governments of Uttar Pradesh, Bombay, Punjab, West Bengal, Madras and Bihar had been received. They were taking steps to revise their syllabi on the lines indicated by the Council with minor modifications.

The need for laying down a procedure for the future working of the Indian Council of Agricultural Education and to ensure follow-up action and continuity in its working, was felt and a Standing Committee of the following members was formed :

1. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
2. Dr T. J. Mirchandani, Principal, Central College of Agriculture, New Delhi
3. Dr L. S. S. Kumar, Principal, Agriculture College, Poona

4. Dr B. L. Sethi, Principal, Agriculture College, Kanpur
5. Dr Amir Ali, Principal, University College of Agriculture, Osmania University, Hyderabad
6. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar
7. Dr S. I. Chadha, Principal, Bombay Veterinary College, Bombay

The Standing Committee would carry on the work in the intervals between the meetings of the Council. The first meeting of the Standing Committee was held on July 11, 1952 at New Delhi.

Veterinary Education

As regards the reorganisation of veterinary education in the country, a note was prepared by the Secretariat of the Council laying down the lines along which the existing courses should be revised for achieving uniformity. The views of the Principals of Veterinary Colleges were obtained and these would be put up before the Standing Committee for consideration.

Sisterhood between Indian and American Universities

In pursuance of the recommendations of the conference of Vice-Chancellors, etc., held in November, 1951, a circular letter was issued to the various Universities to ascertain whether they were interested in the establishment of sisterhood between Indian and American Universities. The Universities of Gujarat, Nagpur, Madras, Banaras, Osmania, Andhra, Agra, Calcutta and Delhi had informed that they were interested in establishing such relations. They were requested to get in touch with the authorities of the Universities concerned in the U.S.A. and settle details of the scheme as to the exchange of professors, the expenditure involved and the funds, which could be found by the Universities themselves. These Universities were further informed that if any financial assistance was required, the detailed scheme should be put up to the Indian Council of Agricultural Research.

International Farm Youth Exchange Programme

The International Farm Youth Exchange Programme sponsored by the National 4-H Club Foundation of the U.S.A. is a sequel to the belief that ' understanding ' is the foundation of world peace.

A secondary objective, as applied to the Indo-American International Farm Youth Exchange, was to give emphasis through the exchange to the development of Farm Youth Organisation in India in order to strengthen the confidence of the youths in themselves and their work and to develop competent rural and agricultural leadership.

The whole programme was financed by the voluntary contributions made by the young members (both boys and girls) of the 4-H Clubs, and other philanthropic institutions of the U.S.A.

On April 14, 1953, 30 Indian farm youths left for the U.S.A. under this programme for a period of six months. The boys would understand the American way of life and its farm youth organizations by living and working with selected American farm families. On return to India these boys would voluntarily help form the Young Farmers' Clubs, etc.

Also 10 farm boys from the U.S.A. came to India under a similar programme in the first week of September and lived with selected Indian farm families to understand the Indian way of life. On return to the U.S.A. these boys would write and speak about India and Indian farm life to groups of American farm people for developing friendly understanding.

CHAPTER VII

PUBLICATIONS AND PUBLICITY

Publications

Indian Farming. The magazine continued to be published from Bombay by Messrs. Associated Advertisers and Printers Ltd. and in March, 1953 completed the second year of its publication in the New Series. By publishing useful information in the form of interesting feature articles, topical notes including hints to the farmers, suggestions on health problems, etc., the Indian Farming proved to be a useful journal to the farmer and his family.

Kheti. Due to the lack of proper printing facilities and adequate publicity machinery, there was no marked improvement in the publication of *Kheti.* Delay in the allocation of a suitable press was mainly responsible for irregular appearance of this journal.

Scientific journals

Publication of the *Indian Journal of Agricultural Science* and *Indian Journal of Veterinary Science and Animal Husbandry* showed an improvement, as would be evident from the fact that in March, 1953 only two issues of each journal were in arrears. In order to ensure timely publication of the journals, time schedule was drawn up in consultation with the press concerned. It is hoped that strict adherence to the time schedule and continued co-operation by the press would ensure regular publication of the journals.

Statistical Newsletter. This quarterly bulletin reporting activities of the Statistical Section of the Council, was regularly published for the interest of the statistical workers all over the world.

Horticultural Abstracts. This is a monthly periodical meant for keeping the research workers in the country posted with the developments in the field of horticultural research in India and other countries. Its publication was regular throughout.

Abstraction of horticultural literature. About 750 abstracts, summaries were taken from about 250 journals, annual reports, bulletins, circulars, leaflets and books published in India and abroad. These were published in '*Horticultural Abstracts*' and were circulated to about 500 horticultural workers, stations, Universities and libraries in India. Care was taken to give details in the abstracts, so that the readers who were not able to get the horticultural literature might be able to follow them fully without consulting the original articles. All the Indian literature on horticulture and most of the foreign horticultural literature akin to Indian conditions was abstracted.

Rice News Teller. A new quarterly journal entitled '*Rice News Teller*' was started and its first issue appeared in the month of January, 1953. The main purpose of this periodical is to report the progress of research and the

results of investigations carried out on rice in different parts of this country and abroad. Information relating to rice production, utilisation and marketing is also included.

Miscellaneous publications

The following were the other publications issued during the period under report :

(1) Bulletin No. 17, entitled, ' A Brief survey of Some of the Important Breeds of Cattle in India ' reprinted with bulletin No. 54, entitled ' A Further Survey of some of the Important Breeds of Cattle and Buffaloes in India'.

(2) Bulletin No. 25, entitled ' The Nutritive Values of Indian Cattle Feeds and the Feeding Animals ', third edition—reprinted.

(3) Bulletin No. 38, entitled ' Manuring of Rice in India ' by R. L. Sethi, revised and brought uptodate by K. Ramiah and C. P. Abraham.

(4) ' Report of the Development of the Cattle and Dairy Industries of India ' by N. C. Wright, second edition—reprinted.

(5) Compendium, Part II. Agriculture and Animal Husbandry Research, 1929-46.

Subsidies

In order to help in the promotion and spread of scientific knowledge, the Council sanctioned subsidies to a number of scientific societies for the publication of their technical journals. The total sum aggregating Rs. 33,100 was sanctioned to meet the expenditure under this head during the year.

The Council also approved of a sum of Rs. 25,000 being earmarked every year for the grant of subsidies.

Prizes

Prizes were awarded for a number of articles on agriculture and animal husbandry published in various standard newspapers and periodicals.

Publicity

Agricultural Information Conference

An all-India Agricultural Information Conference was organised by the Council at Lucknow from November 17 to 19, 1952. The conference was attended by delegates representing the Central and State Governments, educational institutions and research institutes, trade and other private individuals interested in agriculture and animal husbandry. The conference was inaugurated by Shri K. M. Munshi, Governor of Uttar Pradesh and was presided over by Dr Punjabrao Deshmukh, Central Minister for Agriculture. The main aim of the conference was to devise ways and means for setting up a suitable machinery, which could ensure the flow of information from the laboratories to the farmers and also ascertain the problems of the farmers for solution. For this purpose the conference recommended the establishment of Agricultural Information Organization at the Centre and also its counterparts at State, district, *tehsil*, and village levels. The main object of this organisation would be to disseminate agricultural information through posters,

pamphlets, leaflets, films, radio, etc. Action on various recommendations made at the conference was initiated.

Media and methods exhibition

A ' media and methods ' exhibition to spotlight the different methods for dissemination of agricultural information currently used, as well as methods which could be utilized for this purpose, was also arranged at the time of the conference. The various items were such as could be easily adopted by a country like India with the huge problem of mass illiteracy. The use of ' flannelgraph ' was specially recommended for mounting a countrywide campaign for the popularisation and adoption of Japanese method of paddy cultivation. All the various methods of propaganda and publicity were taken recourse to for this purpose, *viz.*, flannelgraph, radio, films and suitable literature in the form of pamphlets, flip-books, charts, posters, etc., in English as well as in regional languages.

The following bulletins and pamphlets were published for the benefit of the extension workers and literate farmers :

I.C.A.R. Review Series

Agricultural Implements for Indian Farmers

I.C.A.R. Information Series (Pamphlets)

1. Soil Conservation in India
2. Green Manuring
3. Cattle Registration in India
4. Growing Potatoes in the Plains (English)
5. Growing Potatoes in the Plains (Hindi)
6. How to Control Red Rot, Smut and Mosaic Diseases of Sugarcane
7. Controlling Virus Diseases of Potatoes
8. Farmer Lal and His Wheat (Hindi)
9. The Japanese Method of Paddy Cultivation
10. Fertilisers for Flower and Vegetable production

The Council also brought out a booklet entitled, ' Vegetable growing in Delhi State ' in order to stimulate effort for the production of fresh vegetables. Written primarily for the kitchen gardeners, the usefulness of this booklet extends equally to the professional market-gardeners, and it was much in demand.

CHAPTER VIII

GENERAL

Library

THE work done at the Indian Council of Agricultural Research, Library, is given under the following heads : (1) Acquisition Section, (2) Service Section, (3) Library Reorganisation, and (4) Library Statistics.

Acquisition Section

The number of books added during the year was 816. These were classified and catalogued. A card catalogue in dictionary form was maintained and kept uptodate. Lists of additions to the library were prepared and circulated to Officers at convenient intervals. Ten such lists were issued during the year.

About 700 different periodicals were being received in the Library. Of these 141 were being subscribed for and the rest were on exchange basis with a few complimentary receipts as well.

After a lapse of number of years, the binding work was taken up and 609 valuable scientific periodicals and a few books were compiled and got bound during the year.

Service Section

Reference Service. The Library did useful bibliographic service during the year. The parties that secured such service included (i) The Officers and staff members of the Council, (ii) Officers and students of the Indian Agricultural Research Institute, New Delhi, (iii) Professors of Delhi University, (iv) Officers in PEPSU, Bihar, Orissa and at Banaras and Trivandrum, (v) M.Sc. and Ph.D. students for their thesis work, (vi) Industrial concerns, *e.g.*, Sonawalla Industries, Bombay, (vii) Ministries and other departments of Central Government at Delhi, (viii) Indian National Scientific Documentation Centre at National Physical Laboratory, New Delhi, and through them a wide circle of clientele in India and abroad. Thus it would be seen that the range of service was extensive and intensive. Several bibliographies were prepared for this service. About 61 reference questions were answered during the year.

Loan Service. The total number of loan transactions during the year was about 7,024.

Consultation Service. About 7,100 publications were consulted within the Library.

Reorganisation

In connection with the reorganisation work the ' three card system ' for recording receipts of periodicals was introduced.

The stationery for introducing the ' ticket system ' for loan transactions was designed and got ready, and shortly this would be in operation.

Temporary weeding work was taken up in the library to create more space for important publications. About 303 items were inspected and temporarily weeded out, keeping a check list for these.

Library statistics

1.	Books added	816
2.	Loan transactions	7024
3.	Books consulted	7100
4.	Periodicals currently received	700 (approx.)
5.	Periodicals subscribed	141
6.	Periodicals exchange and complimentary ..	559
7.	Books bound	609
8.	Lists of additions issued	10

The Librarian was deputed to attend the Australian Library Seminar. He made a study of the working and service in a large number of scientific, technical and University Libraries in New South Wales, Victoria, South Australia and West Australia. He returned back in July, 1952. It is hoped that the experience gained abroad by him would be useful in improving and organising the Council's Library.

APPENDIX I

Meetings of the various organizations of the Indian Council of Agricultural Research held during the year 1952-53

1. A meeting of the Local Sub-Committee of the Standing Committee, June, 1952
2. Meetings of the Agricultural and Animal Husbandry Regional Committees, August-September, 1952
3. A meeting of the Indian Council of Agricultural Education, April, 1952
4. Meetings of the Scientific and Commodity Committees, November, 1952
5. A meeting of the Board of Research, December, 1952
6. A meeting of the Advisory Board, December, 1952
7. A meeting of the Standing Committee, January, 1953
8. A meeting of the Standing Finance Committee, January, 1953
9. A meeting of the Governing Body, January, 1953
10. Annual General Meeting of the Council, January, 1953
11. Special General Meeting of the Council, January, 1953
12. Statistical Conference, February, 1953

APPENDIX II

(*a*) *Schemes, the continuation of which was sanctioned by the Governing Body at its meeting held in January, 1953*

1. Maize Breeding Scheme, Bihar
2. Plant Introduction Scheme, Indian Agricultural Research Institute, New Delhi
3. Plant Virus Scheme, Delhi
4. Plant Virus Scheme, Simla
5. Plant Virus Scheme, Poona
6. Fruit Research Scheme, Hyderabad
7. Abstraction of horticultural literature, Indian Council of Agricultural Research, New Delhi
8. Description of different Varieties of fruits, Indian Council of Agricultural Research, New Delhi
9. Maize Breeding Scheme, Hyderabad
10. *Jowar* and *Bajra* Breeding Scheme, Saurashtra
11. Weed Control Scheme, Poona, Madras, Bombay & West Bengal
12. Improvement of Vegetables, Bombay
13. Improvement of Vegetables, Uttar Pradesh
14. Hybrid *Cumbu* Scheme, Madras
15. Pulse Breeding Scheme, Madhya Bharat
16. Phenology Scheme, Poona
17. Fruit Research Scheme, Madhya Pradesh
18. Termite Research Scheme, Anand
19. Improvement of Indian Agricultural Research Institute, pasture
20. Paddy Breeding Scheme, Madhya Bharat
21. Medicinal Plants Scheme, Forest Research Institute, Dehradun
22. Improvement of cashew-nuts, Madras
23. Improvement of cashew-nuts, Travancore-Cochin
24. Wheat Rust Scheme, Bombay
25. Maize Breeding Scheme, Uttar Pradesh
26. Hybrid Maize Seeds Scheme, Almora
27. Pulse Research Scheme, Madras
28. Pepper Research Scheme, Madras
29. Ginger Research Scheme, Madras
30. Plant Physiology Scheme, Almora
31. DDT experiments at (*a*) Bombay, and (*b*) Indian Agricultural Research Institute, New Delhi

32. Co-ordination of research, Indian Council of Agricultural Research, New Delhi
33. Additional funds for Plant Virus Scheme, Indian Agricultural Research Institute, New Delhi
34. Trace element studies, Indian Agricultural Research Institute, New Delhi
35. Improvement of tuber crops, Madras
36. Banana Research Sub-station Scheme, West Bengal
37. Scheme for training in fruit preservation, Bihar
38. Citrus Fruit Research Scheme, Orissa
39. Orange Research Scheme, Coorg
40. Regional Animal Nutrition Centre Scheme, Anand, Bombay
41. Poultry Development Scheme, Travancore-Cochin
42. Award of fellowship in Animal Husbandry subjects, Indian Council of Agricultural Research, New Delhi
43. Goat Breeding Scheme, Travancore-Cochin
44. Livestock Investigation Scheme, Punjab
45. Delhi Key Village Scheme, Indian Council of Agricultural Research, New Delhi
46. Selective breeding and grading up of indigenous cattle
47. Development of mutton breeds of sheep, Bombay, Madras and Mysore
48. Duck Breeding Scheme, Travancore-Cochin
49. Diseases Investigation Scheme, Madhya Bharat
50. Diseases Investigation Scheme, PEPSU
51. Diseases Investigation Scheme, Saurashtra and Kutch
52. Investigation on mastitis, Bombay
53. Investigation on mastitis, Mysore
54. Helminth parasites affecting poultry, Indian Veterinary Research Institute, Mukteswar
55. Combined bacteriological scheme for studies on milk and milk products, Indian Dairy Research Institute, Bangalore
56. Delhi Milk Supply Scheme, Indian Council of Agricultural Research
57. Evolving a suitable method of sampling wool for measurement of quality, Indian Council of Agricultural Research, New Delhi
58. Award of two fellowships to carry on advanced research in Agricultural Statistics
59. Monograph on 'Agriculture in Ancient India'
60. Indian Council of Agricultural Education

(*b*) *New schemes sanctioned during 1952-53*

1. Japanese method of rice cultivation, Coorg
2. Japanese method of rice cultivation, Mysore

3. Japanese method of rice cultivation, Orissa
4. Japanese method of rice cultivation, West Bengal
5. Japanese method of rice cultivation, Bihar
6. Japanese method of rice cultivation, Madhya Pradesh
7. Japanese method of rice cultivation, Uttar Pradesh
8. Japanese method of rice cultivation, Bombay
9. Japanese method of rice cultivation, Madras
10. Physiology of rice flowering, West Bengal
11. Breeding varieties resistant to *Piriculria*, Madras
12. Studies on paddy agromyzid fly, Hyderabad
13. *Rai* disease of paddy, Kashmir
14. Breeding salt and flood resistant varieties of paddy, Assam
15. Breeding salt and flood resistant varieties of paddy, Uttar Pradesh
16. Breeding salt and flood resistant varieties of paddy, Travancore Cochin
17. Breeding salt and flood resistant varieties of paddy, West Bengal
18. Breeding salt and flood reistant varieties of paddy, Orissa
19. Scheme for work on rice in saline areas, Madras
20. Nutritive value of wheat, Indian Agricultural Research Institute, New Delhi
21. Maize Breeding Scheme, Kashmir
22. Pulse Breeding (New) Scheme, Madhya Bharat, Gwalior
23. Hybrid *Bajra* Scheme, Bombay
24. Utilisation of hormones in horticulture, Madras
25. Remedial measures against San Jose Scale, Kashmir
26. Citrus root stock trials at Kodur, Madras
27. Research in fruits, Kashmir
28. Citrus die-back disease, Indian Agricultural Research Institute, New Delhi
29. Citrus die-back disease, Coorg
30. Citrus die-back disease, Bombay
31. Improvement of vegetables, PEPSU
32. Improvement of vegetables, Madras
33. Improvement of vegetables, Kashmir
34. Improvement of vegetables, Punjab
35. Improvement of vegetables, Hyderabad
36. Improvement of vegetables, West Bengal
37. Insect pests of vegetables, Punjab
38. Cardamom, West Bengal
39. Supplement to the monograph on the ' Fungi of India '

40. Weed control, Madhya Bharat
41. Weed control, Bhopal
42. Weed control, Himachal Pradesh
43. *Fusarium* wilt, Madras University
44. Medicinal plants, Assam
45. Medicinal plants, Kashmir
46. Ergot production, Assam
47. Nitrogen fixation, Madhya Pradesh
48. Soil standardisation methods, Bombay
49. Soil and plant growth, Agra
50. Experiments with Kotka phosphate and dicalcium phosphate Indian Council of Agricultural Research, New Delhi
51. Manurial experiments, Punjab
52. Manurial experiments, Bhopal
53. Green manuring crops, Bihar
54. Green manuring crops, Indian Central Jute Committee
55. Green manuring crops, Central Rice Research Institute, Cuttack
56. Green manuring crops, Uttar Pradesh
57. Green manuring crops, Himachal Pradesh
58. Green manuring crops, Hyderabad
59. Micro-nutrients status of soil, Bombay
60. Pathogens in night soil, Hygiene Institute, Calcutta
61. Supplement to monograph entitled, " Dry Farming in India "
62. Co-ordinated Pasture Land Scheme, Indian Council of Agricultural Research, New Delhi
63. Perin Herbage Incubator, Indian Agricultural Research Institute, New Delhi
64. Perin Herbage Incubator, Indian Veterinary Research Institute, Mukteswar
65. Water requirements of crops, Central Field Research Station, Poona
66. Cytological studies on crop plants, Andhra University
67. Use of phyto-hormones for higher yields, Bombay
68. Chemical stimulation of ovules, Delhi University
69. Spices Enquiry Committee, Indian Council of Agricultural Research, New Delhi
70. Monograph on ' Mechanical Cultivation in India '
71. Pregnancy diagnosis tests, Indian Veterinary Research Institute, Mukteswar, Indian Dairy Research Institute & Calcutta University
72. Definition of the breed characteristics of Gaolao cattle and Berari buffaloes, Madhya Pradesh
73. Physiological genetics of cattle, West Bengal

74. Cattle Breeding Research Scheme, Himachal Pradesh
75. Immune genetics of Indian cattle, Indian Veterinary Research Institute, Mukteswar
76. Fundamental study of quantitative inheritance, Indian Veterinary Research Institute, Mukteswar
77. Sheep Research Station, Punjab
78. Sheep and wool improvement, Himachal Pradesh
79. Sheep and wool improvement, Bihar
80. Sheep and wool improvement, Madras
81. Meat and mohair goat, Bombay
82. Sheep and wool improvement, Rajasthan
83. Sheep and wool improvement, Bombay (Joria Centre)
84. Animal nutrition, West Bengal
85. Animal nutrition, Orissa
86. Further work on paddy straw, Indian Veterinary Research Institute, Mukteswar
87. Veterinary investigation (sheep and goats), Hyderabad
88. Manufacture of a single dose prophylactic rabies vaccine, Indian Veterinary Research Institute, Mukteswar
89. Rabies Research and Diagnostic Centre, Indian Veterinary Research Institute, Mukteswar
90. Parasitic diseases, Mysore
91. Fluke disease of bovine cattle, Bombay
92. Bearing of nutrition on helminthic infections (helminthological aspect), Indian Veterinary Research Institute, Mukteswar
93. Indigenous drugs of India for use in veterinary practice, Indian Veterinary Research Institute, Mukteswar
94. Contagious caprine pleuropneumonia, Indian Veterinary Research Institute, Mukteswar
95. Life history and bionomics of goat warble fly in India, Indian Veterinary Research Institute, Mukteswar
96. Utilization of by-products of Indian dairy industry, Indian Dairy Research Institute, Bangalore
97. Chemistry of mineral tannages, Central Livestock Research Station, Hissar
98. Manufacture of fat liquors, Central Livestock Research Station, Hissar
99. Manufacture of leather boards, Central Livestock Research Station, Hissar
100. Manufacture of chrome retan leather, Central Livestock Research Station, Hissar
101. Laying trials of poultry, Indian Veterinary Research Institute, Mukteswar

102. Coccidiosis in poultry, Indian Veterinary Research Institute, Mukteswar
103. Morphology and biology of Indian honey bee, Allahabad University
104. Production and trial of agricultural implements, Indian Agricultural Research Institute, New Delhi
105. Putting milch cows to work, Punjab
106. Refresher course in Agriculture for young farmers, Manipur
107. Refresher course in Agriculture for young farmers, Assam
108. Refresher course in Agriculture for young farmers, Madras
109. Refresher course in Agriculture for young farmers, Jammu & Kashmir
110. Refresher course in Agriculture for young farmers, Vindhya Pradesh
111. Refresher course in Agriculture for young farmers, Bhopal
112. Refresher course in Agriculture for young farmers, Rajasthan
113. Refresher course in Agriculture for young farmers, Amravati
114. Refresher course in Agriculture for young farmers, Bihar
115. Cost of wool and other products of sheep, Indian Council of Agricultural Research, New Delhi
116. Contribution to the Commonwealth Agriculture Bureau for the construction of a new building, Indian Council of Agricultural Research, New Delhi
117. Grant of subsidy to Indian Science News Association
118. Grant of subsidy to International Society of Plant Morphologists
119. Printing of the publication entitled, " Bibliography of Soil Science and Fertilizers," Indian Council of Agricultural Research, New Delhi
120. Compilation of " Agriculture and Animal Husbandry in India," Indian Council of Agricultural Research, New Delhi
121. Publication of " *Dharti-ke-Lal*," Indian Council of Agricultural Research, New Delhi
122. Printing of an album of " Indian Agriculture & Animal Husbandry," Indian Council of Agricultural Research, New Delhi
123. Japanese method of paddy cultivation, Indian Council of Agricultural Research, New Delhi
124. Livestock and fisheries statistics, Indian Council of Agricultural Research, New Delhi

APPENDIX III

Schemes terminated during 1952-53

1. *Helminthosporium* diseases of rice, West Bengal
2. Pulse breeding, Madras
3. Pulse breeding, Uttar Pradesh
4. Pulse breeding, Orissa
5. Nitrogen fixation in soils, Indian Agricultural Research Institute, New Delhi
6. Phosphatic manuring, Indian Agricultural Research Institute, New Delhi
7. Horticulture, Assam
8. Survey of deciduous fruits, Kashmir
9. Research on orange borers, Wyanad, Madras
10. Coriander disease, Madhya Bharat
11. Characteristics of grey breeds of cattle, Indian Council of Agricultural Research, New Delhi
12. Helminthiasis, Lucknow University
13. Improvement of the technique of manufacture of market *ghee*, Indian Dairy Research Institute, Bangalore
14. Rapid determination of fats, etc., in milk, West Bengal
15. Testing important standard methods for analysis of milk and milk products, Bombay
16. Testing important standard methods for analysis of milk and milk products, Uttar Pradesh
17. Rapid determination of fats, etc., in milk, Bihar
18. Testing standard methods for analysis of milk and milk products, Indian Dairy Research Institute, Bangalore
19. Testing standard methods for analysis of milk and milk products, All India Institute of Hygiene, Calcutta
20. Wool analysis, Bombay University
21. Trace elements in Indian soils, Indian Agricultural Research Institute, New Delhi
22. Bone meal, Indian Agricultural Research Institute, New Delhi
23. Village project, Delhi, Indian Council of Agricultural Research, New Delhi
24. Extension Scheme, Indian Council of Agricultural Research, New Delhi
25. Cultivation of *kudzu* vine, Indian Agricultural Research Institute, New Delhi
26. Co-ordinated crop cutting experiments, Indian Council of Agricultural Research, New Delhi

27. Crop cutting experiments in Indian soils, Uttar Pradesh
28. Crop cutting experiments in Indian soils, Madras
29. Appointment of Mr J. Malcolm Orchard under Point Four Programme
30. Hand-book in Statistics for Use in Plant Breeding
31. Scheme for crop cutting experiments on oil seeds
32. Scheme for crop cutting experiments on jute
33. Cattle Improvement and Insurance Scheme, Patiala

APPENDIX IV

Indian Council of Agricultural Research Society

1. Dr P. S. Deshmukh, Minister for Agriculture, Government of India, New Delhi (President)
2. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
3. Shri M. V. Krishnappa, Deputy Minister for Food and Agriculture, Government of India, New Delhi
4. Shri M. M. Choudhry, Minister-in-charge of Agriculture, Government of Assam, Shillong
5. Dr Anugraha Narayan Sinha, Minister-in-charge of Agriculture, Government of Bihar, Patna
6. Shri B. S. Hiray, Minister-in-charge of Agriculture and Forests, Government of Bombay, Bombay
7. Shri S. L. Tiwari, Minister-in-charge of Agriculture, Government of Madhya Pradesh, Nagpur
8. Dr R. Nagana Gowda, Minister-in-charge of Agriculture, Government of Madras, Fort. St. George, Madras
9. Shri Dinabandhu Sahu, Minister-in-charge of Agriculture, Government of Orissa, Cuttack
10. Sardar Pratap Singh Kairon, Minister-in-charge of Agriculture and Development, Government of Punjab, Simla
11. Shri Charan Singh, Minister-in-charge of Agriculture, Animal Husbandry & Revenue, Government of Uttar Pradesh, Lucknow
12. Dr R. Ahmed, Minister-in-charge of Agriculture, Government of West Bengal, Calcutta
13. Dr M. Chenna Reddy, Minister-in-charge of Agriculture, Government of Hyderabad, Hyderabad Dn. 14
14. Mirza Mohd. Afzal Beg, Minister-in-charge of Agriculture, Jammu and Kashmir, Srinagar/Jammu Tawi
15. Shri V. V. Dravid, Minister-in-charge of Development and Labour, Government of Madhya Bharat, Gwalior/Indore
16. Shri H. Siddaveerappa, Minister-in-charge of Agriculture and Home, Government of Mysore, Bangalore
17. Sardar Dara Singh, Minister-in-charge of Agriculture and Development, Government of Patiala and East Punjab States Union, Patiala

18. Shri Mohan Lal Sukhadia, Minister-in-charge of Agriculture, Government of Rajasthan, Jaipur
19. Shri R. M. Adani, Minister-in-charge of Agriculture, Government of Saurashtra, Rajkot
20. Shri Panampilli Govinda Menon, Minister-in-charge of Finance, Civil Supplies and Agriculture, Travancore-Cochin, Trivandrum
21. Shri Haribhau Upadhyaya, Chief Minister and Minister-in-charge of Agriculture, Ajmer
22. Dr Shankar Dayal Sharma, Chief Minister and Minister-in-charge of Agriculture, Government of Bhopal, Bhopal
23. Shri Sri Chand Chhabra, Chief Commissioner of Bilaspur, Bilaspur (Simla Hills)
24. Shri C. M. Poonacha, Chief Minister and Minister-in-charge of Agriculture, Government of Coorg, Mercara
25. Shri Braham Prakash, Chief Minister and Minister-in-charge, of Agriculture, Government of Delhi, Delhi
26. Dr Y. S. Parmar, Chief Minister and Minister-in-charge of Agriculture, Government of Himachal Pradesh, Simla-4
27. Shri S. A. Ghatge, Chief Commissioner of Kutch, Bhuj
28. Shri Rameshwar Prasad Bhargava, Chief Commissioner of Manipur, Imphal
29. Shri V. Nanjappa, Chief Commissioner of Tripura, Agartala
30. Shri Gopal Sharan Shingh, Minister-in-charge of Agriculture, Government of Vindhya Pradesh, Rewa
31. Shri L. K. Handique, Director of Agriculture, Assam, Shillong
32. Dr J. S. Patel, Director of Agriculture, Bihar, Patna
33. Dr T. G. Shername, Director of Agriculture, Bombay, Poona
34. Dr R. J. Kalamkar, Director of Agriculture, Madhya Pradesh, Nagpur
35. Shri M. S. Sivaraman, Director of Agriculture, Madras
36. Shri V. S. Tilak, Director of Agriculture Orissa, Cuttack
37. Shri H. R. Saini, Director of Agriculture, Punjab, Simla
38. Dr Sant Bahadur Singh, Director of Agriculture, Uttar Pradesh, Lucknow
39. Dr H. K. Nandi, Director of Agriculture and Animal Husbandry, West Bengal, Calcutta
40. Shri P. D. Nair, Director of Agriculture, Hyderabad, Hyderabad-Dn
41. Shri G. M. Butt, Director of Agriculture, Jammu and Kashmir Srinagar/Jammu Tawi
42. Shri B. S. Bapna, Director of Agriculture, Madhya Bharat, Gwalior
43. Shri M. K. Appajappa, Director of Agriculture, Mysore, Bangalore
44. S. Arjan Singh, Director of Agriculture, Patiala and East Punjab States Union, Patiala

45. Shri Shamsher Singh, Director of Agriculture and Food Production, Rajasthan, Jaipur
46. Dr J. C. Ramchandani, Director of Agriculture, Saurashtra, Rajkot
47. Shri M. Sankara Menon, Director of Agriculture, Travancore-Cochin, Trivandrum
48. Shri G. K. Mehra, Director of Veterinary Services, Assam, Gauhati
49. Shri M. I. Malik, Director of Veterinary Services, Bihar, Patna
50. Shri Laxmi Sahai, Director of Animal Husbandry and Veterinary Services, Poona-2
51. Shri M. Y. Mangrulkar, Director of Animal Husbandry, Veterinary Services and Fisheries, Madhya Pradesh, Nagpur
52. Shri V. R. Rajagopalan, Director of Animal Husbandry, Madras, Chepauk, Madras
53. Shri Gurbachan Singh, Director of Animal Husbandry and Veterinary Services, Orissa, Cuttack
54. Major A. C. Aggarwala, Director of Veterinary Services and Warden, of Fisheries, Punjab, Simla
55. Dr R. L. Kaura, Director of Animal Husbandry, Uttar Pradesh, Lucknow
56. Shri P. C. Bannerjee, Assistant Director of Veterinary Services, West Bengal, Calcutta
57. Dr K. S. Shetty, Director of Veterinary Services, Hyderabad, Hyderabad-Dn
58. Dr V. L. Wazir, Director of Veterinary, Jammu and Kashmir, Sringar/Jammu Tawi
59. Shri H. K. Mehra, Director of Animal Husbandry and Veterinary Services, Madhya Bharat, Gwalior
60. Dr P. M. Narayanaswami Naidu, Director of Animal Husbandry, Mysore, Bangalore
61. Sardar Pritam Singh Brar, Director of Veterinary Services, Patiala and East Punjab States Union, Patiala
62. Dr G. S. Rathore, Deputy Director, Veterinary, Rajasthan, Jodhpur
63. Shri C. N. Dave, Livestock Officer, Saurashtra, Rajkot
64. Shri V. K. Madhava Menon, Director of Veterinary Services, Travancore-Cochin, Trivandrum
65. Shri Vishnu Sahay, Secretary, Ministry of Food and Agriculture, Government of India, New Delhi
66. Shri K. S. Hegde, Member, Council of States, Karnool, Sadashiva Rao Road Mangalore, South Kanara (South India) (Representative Council of States)
67. Shri Beni Prasad Aggarwal, Member, Council of States, 119-A Muktaram Babu Street, Calcutta-7 (Representative of the Council of States)

68. Shri K. G. Deshmukh, Member, House of People, Namuna, Amravati, Madhya Pradesh (Representative, House of People)

69. Shri Algu Rai Shastri, Member, House of People, Amila Town, District Azamgarh, Uttar Pradesh (Representative, House of People)

70. Shri Hira Singh Chinaria, Member, House of People, Dalmia Dadri, District Mohindergarh, PEPSU (Represntative, House of People)

71. Dr Indubhai B. Amin, Member, House of People, Alembic Colony, Baroda-3 (Representative, House of People)

72. Shri Ratilal M. Gandhi, c/o Messrs. Ratilal and Co., Clive Bunder Road, Bombay-9 (Representative of the Federation of Indian Chambers of Commerce and Industry)

73. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi

74. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi

75. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi

76. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi

77. Dr S. Datta, Director, Indian Veterinary Research Institute, Muktesswar/Izatnagar

78. Shri M. S. Thacker, Director, Indian Institute of Science, Bangalore

79. Dr N. Parthasarthy, Director, Central Rice Research Institute, Cuttack

80. Dr S. Ramanujan, Director, Central Potato Research Institute, Patna

81. Shri C. R. Ranganathan, President, Forest Research Institute, Dehra Dun

82. Dr M. D. Patel, Director, Institute of Agriculture, Anand

83. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore

84. Shri Thakur Das Bhargava, Member, House of People, Hissar (Member, Standing Committee and Representative, Cental Council of Gosamvardhana)

85. Shri G. R. Valunjkar, Bone Meal Adviser to the Government of India, Ministry of Food and Agriculture, Government of India New Delhi (Representative, Vana Premi Sangh)

86. Shri J. Bannerjee, Deputy Inspector General of Forests, Ministry of Food and Agriculture, Government of India, New Delhi (Representative, Central Board of Forestry)

87. Dr S. S. Bhatnagar, Director, Council of Scientific and Industrial Research, New Delhi (Representative, Council of Scientific and Industrial Research)

88. Shrimati Lilavati Munshi, Member Parliament (Representative All India Women's Food Council)

89. Col. B. M. Vencoba Rao, Secretary (Development) to the Government of Bhopal, Bhopal (Representative, Central Malwa Committee)
90. Shri M. D. Chaturvedi, Inspector General of Forests, Ministry of Food and Agriculture, Government of India, New Delhi
91. Captain Dalipman Singh, Chairman, District Co-operative Bank Ltd., Ramnivas, Fatehpur, U.P. (Representative, Co-operative Movement in India)
92. Dr C. G. Pandit, Secretary, Indian Council of Medical Research, New Delhi (Representative, Indian Council of Medical Research)
93. Dr B. L. Manju Nath, Vice Chancellor, Mysore Univesity, Mysore (Representative, Indian Unversities)
94. Shri Kunji Lal Dube, Vice Chancellor, Nagpur University, Nagpur (Representative, Indian Universities)
95. Dr V. S. Krishna, Vice Chancellor, Andhra University, Waltair (Representative, Indian Universities)
96. Shri A. C. Bannerji, Vice Chancellor, University of Allahabad, Allahabad (Representative, Indian Universities)
97. Shri W. Wilson Mayne, c/o Messrs. Kanan Devan Hills Produce Co., Ltd., Mannar P. O., High Range, Travancore (Joint representative of the Indian Tea Association and United Planters Association of Southern India)
98. Shri S. N. Ramanna, Coffee Planter, Chickamagalore, Mysore State (Representative, Indian Coffee Board)
99. Shri K. Srinivasan, c/o Messrs. A. V. Thomas & Co., Ltd., Alleppey (Travancore-Cochin) (Representative of the Indian Rubber Board)
100. Shri Chimanlal B. Parikh, 28, Appollo Street, Fort, Bombay (Representative, Indian Central Cotton Committee)
101. Shri Basanta Kumar Das, Member, House of People, P.O. Contai, District Midnapore (West Bengal) (Representative, Indian Central Jute Committee)
102. Shri B. L. Singh, c/o Messrs. Bhagirath Ram and Sons, Calcutta-7 (Representative, Indian Lac Cess Committee)
103. Dr T. S. Venkataraman, 56 Thyagaraja Road, Thyagarajanagar, Madras (Representative, Indian Central Sugarcane Committee)
104. Shri P. Balaramakurup, Techno-Chemical Industries, P.O. Box 74, Koshikode, Malabar District, (Madras State) (Representative, Indian Central Coconut Committee)
105. Shri M. Nageswara Rao, Riukur, Guntur, (Madras State) (Representative, Indian Central Tobacco Committee)
106. Shri Deojo Rattansey, c/o The Grain and Oilseeds Merchants Association, Musjid Bunder Road, Bombay-3 (Representative, Indian Central Oilseeds, Committee)
107. Shri Eacharan Iyyanic, Member, House of People, Mangalam, Post, Anjumurthy, Palighat, South Malabar (Representative, Indian Central Arecanut Committee)
108. Shri I. G. Keneddy, Vice President, Indian Central Jute Committee, c/o Messrs Jardine Henderson Ltd., 4, Clive Row, Calcutta

109. Shri Mohanlal Ambalal Parikh, Vice-President, Indian Central Tobacco Committee, 51, Dadyseth Agiary Lane, Bombay-2

110. Shri Dip Narain Sinha, Vice-President, Indian Central Sugarcane Committee and Minister for Animal Husbandry, Veterinary and Co-operation, Bihar, Patna

111. Shri K. P. Madhavan Nair, Member, House of People, Vice-President, Indian Central Coconut Committee, Ernakulam

112. Shri N. G. Ranga, Member, House of People, Vice-President, Indian Central Oilseeds Committee, 51, Sultivan Garden Street, Mylapore, Madras

113. Shri M. N. Chouta, Vice-President, Indian Central Arecanut Committee, Attavar, Mangalore, South Kanara District (Mysore State)

114. Dr S. R. Sen, Economic and Statistical Adviser, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, New Delhi

115. Dr V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, New Delhi

116. Dr B. N. Chopra, Fisheries Development Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi (Representative, Fisheries Research Stations)

117. Shri M. S. Bhatnagar, Joint Secretary, Ministry of Finance (Food and Agriculture Division) and Financial Adviser, Indian Council of Agricultural Research, New Delhi

118. Dr Ram Subhag Singh, Member, House of People, Khajuria, P. O. Dhamar, District Arrah (Bihar) (Representative of Rural Interests)

119. Shri Bapu Sahib Despande, Ittegahally, Bidar (Hyderabad State) (Representative of Rural Interests)

120. Shri S. S. Salemath, 6, Todiwala Road, Poona (Representative of Rural Interests)

121. Shri N. Somana, Member, House of People, Mercara, Coorg (Representative of Rural Interests)

122. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi (Member, Standing Committee)

123. Shri Tulsidas Kilachand, Member, House of People, c/o Kilachand Devchand and Co., 45/47, Appollo Street, Fort, Bombay (Member, Standing Committee)

124. Thakur Bhavani Singh of Pokaran, Member, House of People, Pokaran House, Jodhpur (Member, Standing Committee)

125. Shri M. P. Gandhi, c/o Gandhi & Co., Jan Mansion, Sir Pherozeshah Mehta Road, Fort, Bombay

126. Director of Remounts, Veterinary Farms, Army Headquarters, Quartermaster General's Branch, New Delhi

127. Seth Govind Das, Member, House of People, Raja Gokaldas Palace, Jubbulpore

128. Shri D. H. Duyf, Director and General Manager, Gwalior Agricultural Co., Ltd., Dabra, Gwalior District (Madhya Bharat)
129. Mrs. Marie Buck, Welfare Officer, Simpson Medical Centre, Chintadripet, Madras-2
130. Shri P. A. Gopalkrishnan, Joint Secretary, Ministry of Food and Agriculture, Government of India, New Delhi
131. Shri R. S. Krishnaswamy, Joint Secretary, Ministry of Food and Agriculture, Government of India, New Delhi
132. Dr B. Viswanath, Adviser on Agricultural Programmes, Planning Commission, New Delhi
133. Shri Harjas Rai, Director of Animal Husbandry, Ajmer
134. Shri Manilal M. Nanavati, President, Indian Society of Agricultural Economics, Bombay
135. Thakur Sultan Singh, Director of Agriculture, Vindhya Pradesh, Rewa

APPENDIX V

Governing Body

1. Dr P. S. Deshmukh, Minister for Agriculture, Government of India, New Delhi (Chairman)
2. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
3. Shri M. V. Krishnappa, Deputy Minister for Food and Agriculture, Government of India, New Delhi
4. Shri M. M. Choudhury, Minister-in-charge of Agriculture, Government of Assam, Shillong
5. Dr Anugraha Narain Sinha, Minister-in-charge of Agriculture, Government of Bihar, Patna
6. Shri B. S. Hiray, Minister-in-charge of Agriculture and Forests, Government of Bombay, Bombay
7. Shri S. L. Tiwari, Minister-in-charge of Agriculture, Animal Husbandry, Fisheries and Co-operation, Government of Madhya Pradesh, Nagpur
8. Dr R. Nagana Gowda, Minister-in-charge Agriculture, Government of Madras, Madras
9. Shri Dinabandhu Sahu, Minister-in-charge of Agriculture, Animal Husbandry, Forestry and Fisheries, Government of Orissa, Cuttack
10. Shri Pratap Singh Kairon, Minister-in-charge of Agriculture, Government of Punjab, Simla-2
11. Shri Charan Singh, Minister-in-charge of Agriculture, Animal Husbandry and Revenue, Government of Uttar Pradesh, Lucknow
12. Dr R. Ahmed, Minister-in-charge of Agriculture, West Bengal, Calcutta
13. Dr M. Chenna Reddy, Minister-in-charge of Agriculture, Government of Hyderabad, Hyderabad Dn.
14. Mirza Mohd. Afzal Beg, Minister-in-charge of Agriculture and Revenue, Government of Jammu and Kashmir, Srinagar
15. Shri V. V. Dravid, Minister-in-charge of Agriculture, Government of Madhya Bharat, Gwalior/Indore
16. Shri H. Siddaveerappa, Home Minister and Minister-in-charge of Agriculture, Government of Mysore, Bangalore
17. Sardar Dara Singh, Minister-in-charge of Agriculture, Government of Patiala and East Punjab States Union, Patiala
18. Shri Mohan Lal Sukhadia, Minister-in-charge of Agriculture, Government of Rajasthan, Jaipur
19. Shri R. M. Adani, Minister-in-charge of Agriculture, Government of Saurashtra, Rajkot

20. Shri Panampilli Govinda Menon, Minister-in-charge of Agriculture, Finance and Civil Supplies, Government of Travancore-Cochin, Trivandrum
21. Shri Vishnu Sahay, Secretary, Ministry of Food and Agriculture, Government of India, New Delhi
22. Shri Haribhau Upadhyaya, Chief Minister and Minister-in-charge of Agriculture, Ajmer
23. Dr Shankar Dayal Sharma, Chief Minister and Minister-in-charge of Agriculture, Government of Bhopal, Bhopal
24. Shri Sri Chand Chhabra, Chief Commissioner, Bilaspur State, Simla Hills
25. Shri C. M. Poonacha, Chief Minister and Minister-in-charge of Agriculture, Government of Coorg, Mercara
26. Shri Braham Prakash, Chief Minister and Minister-in-charge of Agriculture, Government of Delhi, Delhi
27. Dr Y. S. Paramar, Chief Minister and Minister-in-charge of Agriculture, Government of Himachal Pradesh, Simla-4
28. Shri S. A. Ghatge, Chief Commissioner of Kutch, Bhuj
29. Shri Rameshwar Prasad Bhargava, Chief Commissioner of Manipur, Imphal
30. Shri V. Nanjappa, Chief Commissioner of Tripura, Agartala
31. Shri Gopal Saran Singh, Minister-in-charge of Agriculture, Government of Vindhya Pradesh, Rewa
32. Shri K. S. Hegde, Member of the Council of States, Karnad, Sadshiva Rao Road, Mangalore, South Kanara
33. Shri Algurai Shashtri, Member of the House of People, Amila Town, Azamgarh
34. Dr Indubhai Amin, Member of the House of People, Alembic Colony, Baroda-3
35. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi (Member, Standing Committee)
36. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi (Member, Standing Committee)
37. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi (Member, Standing Committee)
38. Shri Chimanlal B. Parikh, Vice-President, Indian Central Cotton Committee, 28, Apollo Street, Fort, Bombay (Member, Standing Committee)
39. Shri M. S. Bhatnagar, Financial Adviser, Indian Council of Agricultural Research, New Delhi (Member, Standing Committee)
40. Dr S. R. Sen, Economic and Statistical Adviser, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, New Delhi (Member, Standing Committee)
41. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi (Member, Standing Committee)

42. Shri Tulsidas Kilachand, Member, House of People, c/o Kilachand Devchand & Co., 45/47, Appollo Street, Fort, Bombay (Member, Standing Committee).
43. Thakur Bhawani Singh of Pokaran, Member, House of People, Pokaran House, Jodhpur (Member, Standing Committee)
44. Shri Thakur Das Bhargava, Member, House of People, Anand Bhavan, Hissar, Punjab (Member, Standing Committee)
45. Dr T. G. Shirname, Director of Agriculture, Bombay, Poona (Representative, Advisory Board)
46. Dr P. M. Narayanaswami Naidu, Director of Veterinary Services, Mysore, Bangalore (Representative, Advisory Board)
47. Shri M. P. Gandhi, c/o Gandhi & Co., Jan Mansion, Sir Pherozeshah Mehta Road, Fort, Bombay

APPENDIX VI

Standing Committee

1. Dr Panjabrao S. Deshmukh, Minister for Agriculture, Government of India, New Delhi (Chairman)
2. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
3. Shri M. V. Krishnappa, Deputy Minister for Food and Agriculture, Government of India, New Delhi
4. Shri Charan Singh, Minister-in-charge of Agriculture, Uttar Pradesh, Lucknow (Representative, Ministers-in-charge of Agriculture in Part ' A ' States)
5. Shri H. Siddaveerappa, Minister-in-charge of Agriculture, Government of Mysore, Old Public Offices, Bangalore (Representative of the Ministers-in-charge of Agriculture in Part ' B ' States)
6. Shri Shankar Prasad, Chief Commissioner, Delhi (Representative of the Ministers-in-charge of Agriculture in Part ' C ' States)
7. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
8. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
9. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi
10. Shri Chimanlal B. Parikh, Vice-President, Indian Central Cotton Committee, 28, Appollo Street, Fort, Bombay (Representative of the Vice-Presidents of the Central Commodity Committees
11. Shri M. S. Bhatnagar, Financial Adviser, Indian Council of Agricultural Research, New Delhi
12. Dr S. R. Sen, Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India, New Delhi
13. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi
14. Shri Tulsidas Kilachand, Member, House of People, c/o Kilachand Devchand & Co., 45/47, Appollo Street, Fort, Bombay
15. Thakur Bhawani Singh of Pokaran, Member, House of People, Pokaran House, Jodhpur
16. Shri Thakur Das Bhargava, Member, House of People, Anand Bhavan, Hissar, Punjab

APPENDIX VII

Advisory Board

1. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi (Chairman)
2. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
3. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
4. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi
5. Agricultural Marketing Adviser to the Government of India, Directorate of Marketing and Inspection, Ministry of Food and Agriculture, New Delhi
6. Dr S. R. Sen, Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India, New Delhi
7. Dr V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, New Delhi
8. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
9. Dr S. Datta, Director, Indian Veterinary Research Institute, Mukteswar/Izatnagar
10. Shri M. S. Thacker, Director, Indian Institute of Science, Bangalore
11. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore
12. Dr N. Parthasarathy, Director, Central Rice Research Institute, Cuttack
13. Dr S. Ramanujam, Director, Central Potato Research Institute, Patna
14. Shri L. K. Handique, Director of Agriculture, Assam, Shillong
15. Dr J. S. Patel, Director of Agriculture, Bihar, Patna
16. Dr T. G. Shirname, Director of Agriculture, Bombay State, Poona
17. Dr. R. J. Kalamkar, Director of Agriculture, Madhya Pradesh, Nagpur
18. Shri M. S. Sivaraman, Director of Agriculture, Madras State, Chepauk, Madras
19. Shri V. S. Tilak, Director of Agriculture, Orissa, Cuttack
20. Shri H. R. Saini, Director of Agriculture, Punjab, Simla
21. Dr Sant Bahadur Singh, Director of Agriculture, Uttar Pradesh, Lucknow
22. Dr H. K. Nandi, Director of Agriculture and Animal Husbandry, West Bengal, Calcutta

23. Shri P. D. Nair, Director of Agriculture, Hyderabad, Hyderabad Dn.
24. Shri G. M. Butt, Director of Agriculture, Jammu and Kashmir, Srinagar/ Jammu Tawi
25. Shri B. S. Bapna, Director of Agriculture, Madhya Bharat, Gwalior
26. Shri M. K. Appajappa, Director of Agriculture, Mysore, Bangalore
27. Dr Arjan Singh, Director of Agriculture, Patiala and East Punjab States Union, Patiala
28. Shri Shamsher Singh, Director of Agriculture and Food Production, Rajasthan, Jaipur
29. Dr J. C. Ramchandani, Director of Agriculture, Saurashtra, Rajkot
30. Shri M. Sankara Menon, Director of Agriculture, Travancore-Cochin, Trivandrum
31. Shri G. K. Mehra, Director of Veterinary Services, Assam, Gauhati
32. Shri M. I. Malik, Director of Veterinary Services, Bihar, Patna
33. Shri Lakshmi Sahai, Director of Animal Husbandry and Veterinary Services, Bombay, Poona-2
34. Shri M. Y. Mangrulkar, Director of Veterinary Services, Animal Husbandry and Fisheries, Madhya Pradesh, Nagpur
35. Shri V. R. Rajagopalan, Director of Animal Husbandry, Madras, Chepauk, Madras
36. Shri Gur Bachan Singh, Director of Animal Husbandry and Veterinary Services, Orissa, Cuttack
37. Major A. C. Aggarwala, Director of Veterinary Services and Warden of Fiseries, Punjab, Simla
38. Dr R. L. Kaura, Director of Animal Husbandry, Uttar Pradesh, Lucknow
39. Shri P. C. Bannerjee, Assistant Director of Veterinary Services, West Bengal, Calcutta
40. Dr K. S. Shetty, Director of Veterinary, Hyderabad State, Hyderabad Dn.
41. Dr V. L. Wazir, Director of Veterinary, Jammu and Kashmir, Srinagar/ Jammu Tawi
42. Shri H. K. Mehra, Director of Veterinary Services and Animal Husbandry, Madhya Bharat, Gwalior
43. Dr P. M. Narayanswami Naidu, Director of Animal Husbandry, Mysore, Bangalore
44. Sardar Pritam Singh Brar, Director of Veterinary Services, Patiala and East Punjab States Union, Patiala
45. Dr G. S. Rathore, Deputy Director, Veterinary, Rajasthan, Jodhpur
46. Shri C. N. Dave, Livestock Officer, Saurashtra, Rajkot
47. Shri V. K. Madhava Menon, Director of Veterinary Services, Travancore-Cochin, Trivandrum
48. Shri Harjas Rai, Director of Animal Husbandry, Ajmer (Representative of Part 'C' States)

49. Thakur Sultan Singh, Director of Agriculture, Vindhya Pradesh, Rewa (Representative of Part 'C' States)
50. Shri C. R. Ranganathan, President, Forest Research Institute, Dehra Dun
51. Dr C. G. Pandit, Secretary, Indian Council of Medical Research, New Delhi (Representative, Indian Council of Medical Research)
52. Shri Kunji Lal Dube, Vice-Chancellor, Nagpur University, Nagpur (Representative, Indian Universities)
53. Prof. A. C. Bannerji, Vice-Chancellor, Allahabad University, Allahabad (Representative, Indian Universities)
54. Dr B. L. Manju Nath, Vice-Chancellor, Mysore University, Mysore (Representative, Indian Universities)
55. Dr V. S. Krishna, Vice-Chancellor, Andhra University, Waltair (Representative of Indian Universities)
56. Shri W. Wilson Mayne, c/o Messrs. Kahan Devan Hills Produce Co., Ltd., Mannar, P.O. High Range, Travancore (Representative, Indian Tea Association and United Planters Associatoin of Southern India)
57. Shri Chimanlal B. Parikh, 28, Appollo Street, Bombay (Representative, Indian Central Cotton Committee)
58. Shri Basanta Kumar Das, Member, House of People, P.O. Contai, District Midnapore, West Bengal (Representative, Indian Central Jute Committee)
59. Shri B. L. Singh, c/o M/s. Bhagirath Ram and Sons, Calcutta-7 (Representative of the Indian Lac Cess Committee)
60. Dr T. S. Venkataraman, 56, Thiyagaraja Road, Thayaganagar, Madras (Representative, Indian Central Sugarcane Committee)
61. Shri P. Balarama Kurup, Techno-Chemical Industries, P. O. Box 74, Kozhikode, Malabar District, Madras (Representative, Indian Central Coconut Committee)
62. Shri M. Nageswara Rao, Etukur P.O. Guntur, Madras (Representative, Indian Central Tobacco Committee)
63. Shri Devji Ratansey, c/o The Grain and Oilseeds Merchants Association, Musjid Bunder Road, Bombay-31 (Representative, Indian Central Oilseeds Committee)
64. Shri Eacharan Iyyani, Member, House of People, Mangalore Post, Anjumarthy, South Kanara (Representative of the Indian Central Arecanut Committee)
65. Captain Dalipman Singh, Chairman, District Co-operative Bank Ltd., Ram Niwas, Fatehpur, Uttar Pradesh (Representative, Co-operative Movement in India)
66. Shri S. N. Ramana, Coffee Planter, Chickmagalore, Mysore State (Representative, Indian Coffee Board)
67. Shri K. Srinivasan, c/o Messrs. K. V. Thomas & Co., Ltd., Alleppey, Travancore-Cochin (Representative, Indian Rubber Board)

68. Dr B. N. Chopra, Fisheries Development Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi (Representative, Fisheries Research Stations)
69. Dr H. S. Pruthi, Plant Protection Adviser to the Government of India, Directorate of Plant Protection, Quarantine and Storage, Ministry of Food and Agriculture, New Delhi (Member, Board of Research)
70. Dr B. Viswanath, Adviser, Agricultural Programme, Planning Commission, M. Block, New Delhi (Member, Boards of Research and Extension)
71. Dr P. Parija, 10, Cantonment Road, Cuttack (Member, Board of Research)
72. Shri Jhunna Singh, Chief Conservator of Forests, Punjab, Simla (Member, Board of Extension)
73. Dr Baini Prasad, Director of Fisheries, West Bengal, Calcutta
74. Shri J. C. Ryan, Registrar of Co-operative Societies, Madras (Member, Board of Extension)
75. Shri Kali Das Sawhney, Secretary, Indian Central Cotton Committee, Bombay (Member, Board of Extension)
76. Dr M. D. Patel, Director of the Institute of Agriculture, Anand (Member, Board of Extension)
77. Shri D. H. Duyf, Director and General Manager, Gwalior Agricultural Co., Ltd., Dabra, Gwalior, Madhya Bharat (Member, Board of Extension)
78. Mrs. Marie Buck, Welfare Officer, Simpson Medical Centre, Napier Park, Chintadripet, Madras-2 (Member, Board of Extension)
79. Shri Nityanand Kanungo, Member, House of People, Bakhrabad, P.O. Chandni Chowk, Cuttack (Member, Board of Extension)
80. The Director of Remounts and Veterinary Farms, Army Headquarters, Quartermaster General's Branch, New Delhi
81. Dr P. C. Mahalanobis, Statistical Adviser, Cabinet Secretariat, Rashtrapati Bhavan, New Delhi
82. Dr S. S. Bhatnagar, Director, Council of Scientific and Industrial Research, New Delhi
83. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi (Secretary)

APPENDIX VIII

Board of Research

1. Dr P. S. Deshmukh, Minister for Agriculture, Government of India, New Delhi (Chairman)
2. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
3. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
4. Dr S. R. Sen, Economic and Statistical Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi
5. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
6. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
7. Dr V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, New Delhi
8. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar
9. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore
10. Dr H. S. Pruthi, Plant Protection Adviser to the Government of India, New Delhi
11. Dr N. Parthasarathy, Director, Central Rice Research Institute, Cuttack
12. Dr B. Viswanath, Adviser, Agricultural Programmes, Planning Commission, New Delhi
13. Shri Lakshmi Sahai, Director of Animal Husbandry and Veterinary Services, Bombay State, Poona
14. Dr P. Parija, 10, Cantonment Road, Cuttack
15. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi (Secretary)

APPENDIX IX

Board of Extension

1. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi (Chairman)
2. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
3. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
4. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi
5. Dr V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, New Delhi
6. Dr S. B. Singh, Director of Agriculture, Uttar Pradesh, Lucknow
7. Dr J. S. Patel, Director of Agriculture, Bihar, Patna
8. Dr R. L. Kaura, Director of Animal Husbandry, Uttar Pradesh, Lucknow
9. Shri V. R. Rajagopalan, Director of Animal Husbandry, Madras State, Chepauk, Madras
10. Shree Jhunna Singh, Chief Conservator of Forests, Punjab, Simla
11. Dr Baini Prasad, Director of Fisheries, West Bengal, Calcutta
12. Shri J. C. Ryan, Registrar of Co-operative Societies, Madras State, Madras
13. Shri Kalidas Sawhney, Secretary, Indian Central Cotton Committee, Bombay
14. Dr B.Viswanath, Adviser, Agricultural Programmes, Planning Commission, New Delhi
15. Shri M. D. Chaturvedi, Inspector General of Forests, Ministry of Food and Agriculure, Government of India, New Delhi
16. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
17. Dr M. D. Patel, Director, Institute of Agriculture, Anand
18. Shri D. H. Duyf, Director and General Manager, The Gwalior Agricultural Company, Limited, Dabra, Gwalior
19. Mrs. Marie Buck, Welfare Officer, Simpson Medical College, Napier Park, Chintadripet, Madras-2
20. Shri Nityanand Kanungo, Member, House of People, Bakhrabad, P.O. Chandni Chowk, Cuttack

APPENDIX X

Standing Finance Committee

1. Shri Vishnu Sahay, Secretary, Ministry of Food and Agriculture, Government of India, New Delhi
2. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
3. Shri M. S. Bhatnagar, Joint Secretary, Ministry of Finance (Food and Agriculture Division), Government of India (Financial Adviser, Indian Council of Agricultural Research, New Delhi)
4. Dr R. Ahmed, Minister-in-charge of Agriculture, Government of West Bengal, Calcutta (Member of the Governing Body)
5. Mirza Mohd. Afzal Beg, Minister-in-charge of Agriculture, Jammu and Kashmir, Srinagar (Member of the Governing Body)
6. Shri M. P. Gandhi, c/o Gandhi & Co., Sir Pherozeshah Mehta Road Fort, Bombay (Member of the Governing Body)
7. Shri Algurai Shashtri, Member, House of People, Amila Town, District Azamgarh (U.P.)
8. Shri Kamta Prasad, Minister-in-charge of Agriculture, Government of Bhopal (Member of the Governing Body)
9. Dr M. D. Patel, Director, Institute of Agriculture, Anand
10. Dr K. N. Bahl, Vice-Chancellor, Patna University, Patna
11. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi

APPENDIX XI

Local Sub-Committee of the Standing Committee

1. Dr Punjabrao S. Deshmukh, Minister for Agriculture, Government of India, New Delhi
2. Shri M. V. Krishnappa, Deputy Minister for Food and Agriculture, Government of India, New Delhi
3. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
4. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
5. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
6. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi
7. The Financial Adviser, Indian Council of Agricultural Research, New Delhi
8. Dr S. R. Sen, Economic and Statistical Adviser, Directorate of Economics and Statistics, Ministry of Food and Agriculture, Government of India, New Delhi
9. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi

APPENDIX XII

REGIONAL COMMITTEES

Agriculture Side

I. *Temperate Himalayan Region*

1. Agricultural Commissioner with the Government of India, New Delhi (Convener and Chairman)
2. Director of Agriculture, Assam, Shillong
3. Director of Agriculture, Uttar Pradesh, Lucknow
4. Director of Agriculture, Punjab, Simla East
5. Director of Agriculture, Himachal Pradesh, Simla
6. Director of Agriculture, Kashmir, Srinagar
7. Superintendent, Potato Research Station, Simla
8. Director, Central Potato Research Institute, Patna, Bihar
9. President, Forest Research Institute, Dehra Dun
10. Dr N. P. Mohan, Conservator of Forests, Himachal Pradesh
11. Shri Boshi Sen, Director, Vivekananda Laboratory, Almora (U.P.)
12. Director of Agriculture or Agricultural Officer, Bilaspur (Simla Hills)
13. Director of Agriculture or Agricultural Officer Patiala and East Punjab States Union, PEPSU, Nabha
14. Director, Indian Agricultural Research Institute, New Delhi

II. *Dry Northern Region* (*Wheat*)

1. Agricultural Commissioner with the Government of India (Convener and Chairman), New Delhi
2. Director of Agriculture, Punjab, Simla East
3. Director of Agriculture, Madhya Pradesh, Nagpur
4. Director of Agriculture, Uttar Pradesh, Lucknow
5. Director of Agriculture, Madhya Bharat, Gwalior
6. Director, Institute of Plant Industry, Indore
7. Director, Indian Agricultural Research Institute, New Delhi
8. Director of Agriculture, Rajasthan, Jaipur
9. Director of Agriculture, Patiala and East Punjab States Union, Patiala
10. Head of the Division of Engineering, Indian Agricultural Research Institute, New Delhi
11. Director of Agriculture, Vindhya Pradesh

12. Director of Agriculture, Saurashtra
13. Director of Agriculture, Bhopal
14. Director of Agriculture or Agricultural Officer, Kutch
15. Assistant Director of Agriculture, Delhi
16. Agricultural Officer, Ajmer
17. Director of Agriculture, Bombay, Poona

III. *Eastern Region* (*Rice*)

1. Agricultural Commissioner with the Government of India (Convener and Chairman)
2. Director of Agriculture, Assam, Shillong
3. Director of Agriculture, West Bengal, Calcutta
4. Director of Agriculture, Bihar, Patna
5. Director of Agriculture, Orissa, Cuttack
6. Director of Agriculture, Madhya Pradesh, Nagpur
7. Director of Agriculture, Uttar Pradesh, Lucknow
8. Director of Agriculture, Madras, Madras
9. Director, Central Rice Research Institute, Cuttack
10. Director, Jute Research Laboratories, Barrackpore, West Bengal
11. Director of Agriculture or Agricultural Officer, Tripura
12. Director, Indian Agricultural Research Institute, New Delhi
13. Agricultural Officer, Manipur

IV. *Southern Region* (*Millets*)

1. Agricultural Commissioner with the Government of India, New Delhi (Convener and Chairman)
2. Director of Agriculture, Uttar Pradesh, Lucknow
3. Director of Agriculture, Madhya Pradesh, Nagpur
4. Director of Agriculture, Madhya Bharat, Gwalior
5. Director of Agriculture, Hyderabad, Hyderabad Dn.
6. Director of Agriculture, Madras, Madras
7. Director of Agriculture, Bombay, Poona
8. Director of Agriculture, Mysore, Bangalore
9. Director, Indian Institute of Science, Bangalore
10. Director, Institute of Plant Industry, Indore
11. Director of Agriculture, Orissa, Cuttack
12. Director, Indian Agricultural Research Institute, New Delhi

V. *Coastal Region*

1. Agricultural Commissioner with the Government of India (Convener and Chairman), New Delhi

2. Director of Agriculture, Madras, Madras
3. Director of Agriculture, Mysore, Bangalore
4. Director of Agriculture, Coorg, Mercara
5. Director of Agriculture, Travanore-Cochin, Trivandrum
6. Director of Agriculture, Bombay, Poona
7. Director, Indian Institute of Science, Bangalore
8. Director, Indian Agricultural Research Institute, New Delhi

ANIMAL HUSBANDRY SIDE

I. *Northern Regional Committee*

1. Animal Husbandry Commissioner with the Government of India, (Convener and Chairman)
2. Director of Animal Husbandry, Uttar Pradesh, Lucknow
3. Director of Veterinary Services, Punjab, Dagshai
4. Director of Veterinary Services, Bombay State, Poona
5. Director of Veterinary Services and Animal Husbandry Services, Madhya Bharat, Gwalior
6. Director of Agriculture, Rajasthan, Jaipur
7. Director of Veterinary Services, Patiala and East Punjab States Union, Patiala
8. Director, Indian Veterinary Research Institute, Izatnagar
9. Director of Agriculture, Saurashtra, Rajkot
10. Animal Husbandry Officer, Kutch, Bhuj
11. Director of Animal Husbandry, Ajmer, Ajmer
12. Director, Institute of Agriculture, Anand (Western Rly.)
13. Animal Husbandry Officer, Bhopal, Bhopal
14. Director of Agriculture, Bombay State, Poona

II. *Temperate Regional Committee*

1. Animal Husbandry Commissioner with the Government of India, New Delhi (Convener and Chairman)
2. Director of Animal Husbandry, Uttar Pradesh, Lucknow
3. Director of Veterinary Services, Punjab, Dagshai
4. Director of Animal Husbandry, Civil Veterinary Department, Assam, Gauhati
5. Director, Civil Veterinary Department, Jammu and Kashmir, Srinagar
6. Shri J. N. Saini, Animal Husbandry Officer, Himachal Pradesh, Simla
7. Chief Conservator of Forests, Himachal Pradesh, Simla
8. Director, Indian Vaterinary Research Institute, Izatnagar (U.P.)

III. *Eastern Regional Committee*

1. Animal Husbandry Commissioner with the Government of India, (Convener and Chairman)
2. Director of Animal Husbandry, Madras, P.O. Triplicane, Madras
3. Assistant Director of Veterinary Services, West Bengal, Calcutta
4. Director of Animal Husbandry, Uttar Pradesh, Lucknow
5. Director of Veterinary Services, Bihar, Patna
6. Director of Veterinary Services, Madhya Pradesh, Nagpur
7. Director, Civil Veterinary Department, Assam, Gauhati
8. Director of Veterinary Services and Animal Husbandry, Orissa, Cuttack
9. Chief Veterinary Officer, Coorg, Mercara
10. Director of Animal Husbandry, Travancore-Cochin, Trivandrum
11. Representative, Allahabad Agricultural Institute, Allahabad
12. Major J. M. Lahiri, Principal, Bengal Veterinary College, Belgachia, Calcutta
13. Shri S. K. Sen, Director of Animal Husbandry, Bihar, Patna
14. Chief Animal Husbandry Officer, Vindhya Pradesh, Rewa
15. Director of Veterinary Services, Bombay, Poona
16. Director of Agriculture, Bombay State, Poona

IV. *Southern Regional Committee*

1. Animal Husbandry Commissioner with the Government of India, (Convener and Chairman)
2. Director of Animal Husbandry, Madras, P. O. Triplicane, Madras
3. Director of Veterinary Services, Bombay, Poona
4. Director of Veterinary Services, Madhya Pradesh, Nagpur
5. Director, Civil Veterinary Department, Hyderabad Dn.
6. Director of Dairy Research, Indian Dairy Research Institute, Bangalore
7. Director of Animal Husbandry, Mysore, Bangalore
8. Director, Indian Institute of Science, Bangalore
9. Director of Agriculture, Bombay State, Poona

APPENDIX XIII

SCIENTIFIC COMMITTEES

Botany Committee

1. Shri Boshi Sen, Director, Vivekanand Laboratory, Almora
2. Prof. P. Maheswari, Head of the Department of Botany, Delhi University, Delhi
3. Professor Jai Chand Luthra, c/o Dr. R. S. Vasudeva, Head of the Division of Mycology, Indian Agricultural Research Institute, New Delhi
4. Dr A. C. Joshi, Professor of Botany, Government College, Hoshiarpur
5. Dr B. C. Kundu, Director, Jute Agricultural Research Institute, Indian Central Jute Committee, Hoogly
6. Dr S. M. Sikka, Deputy Director of Intensive Cultivation, Ministry of Food and Agriculture, Government of India, New Delhi
7. Shri P. D. Gadkari, Deputy Secretary, Indian Central Cotton Committee, Bombay
8. Shri V. M. Chavan, Deputy Director of Agriculture (Crop Research), Bombay State, Poona
9. Dr T. R. Mehta, Economic Botanist to the Government of Uttar Pradesh, Kanpur
10. Dr H. K. Nandi, Director of Agriculture, West Bengal, Calcutta
11. Dr R. B. Ekbote, Wheat Specialist to the Government of Madhya Pradesh, Hoshangabad
12. Dr Bhola Nath, Botanist, Institute of Plant Industry, Indore

Ex-officio members

13. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi (Chairman)
14. The Director, Central Rice Research Institute, Cuttack
15. Officers of the Council

Plant Diseases Committee

1. Dr R. S. Vasudeva, Head of the Division of Mycology, Indian Agricultural Research Institute, New Delhi (Chairman)
2. The Mycologist to the Government of Madras, Madras
3. Dr B. B. Mundkur, Professor of Botany, Poona University, Poona
4. Dr K. D. Bagchee, Mycologist and Acting Forest Botanist, Forest Research Institute, Dehra Dun
5. Dr Raghunath Prasad Asthana, Plant Pathologist and Principal, Agricultural College, Madhya Pradesh, Nagpur

6. Dr P. R. Mehta, Plant Pathologist to the Government of Uttar Pradesh, Kanpur
7. Sayed Vaheeddudeen, Plant Pathologist to the Government of Hyderabad, Himayat Sagar, Hyderabad, Dn.
8. Dr M. K. Patel, Plant Pathologist to the Government of Bombay, Poona
9. Dr N. Prasad, Professor of Bacteriology and Plant Pathology, Institute of Agriculture, Anand

Ex-officio members

10. Officers of the Council

ENTOMOLOGY AND ANIMAL PESTS OF CROPS COMMITTEE

1. Dr Hem Singh Pruthi, Plant Protection Adviser to the Government of India, Directorate of Plant Protection, Quarantine and Storage, Ministry of Food and Agriculture, Government of India, New Delhi (Chairman)
2. Dr K. B. Lal, Entomologist to the Government of Uttar Pradesh, Kanpur
3. Dr K. N. Trehan, Entomologist to the Government of Punjab, Ludhiana
4. Entomologist to the Government of Madras, P. O. Lawley Road Coimbatore
5. Dr G. A. Patel, Entomologist to the Government of Bombay, Agricultural College, Poona-5
6. Dr M. S. Mani, Professor of Zoology, St. John's College, Agra
7. Shri R. N. Muttoo, Honorary General Secretary, All India Bee Keepers' Association, Ramgarh, District Nainital, Uttar Pradesh
8. Dr R. L. Gupta, Entomologist to the Government of Madhya Pradesh, Agricultural College, Nagpur
9. Syed Wajid Hussain, Honey Development Officer, Uttar Pradesh, Chhota Jafar Manzil, V. N. Verma Road, Lucknow

Ex-officio members

10. Shri K. R. Sontakay, Director of Storage, Storage Directorate, Ministry of Food and Agriculture, Government of India, New Delhi
11. Dr E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi
12. Officers of the Council

SOIL SCIENCE COMMITTEE

1. Dr B. Viswanath, 8A/85, Western Extension Area, Karolbagh, New Delhi (Chairman)
2. Dr J. A. Daji, Deputy Director of Agriculture (Research and Education), Bombay, Poona

3. Dr H. N. Mukherjee Agricultural Chemist to the Government of Bihar, Patna
4. Dr J. K. Basu, Soil Physicist to the Government of Bombay, Agricultural College, Poona-5
5. Dr V. Subramanyam, Director, Central Food Technological Research Institute, Mysore
6. Dr R. L. Uppal, Assistant Director (Soils), Central Road Research Institute, P.O. Okhla, Delhi
7. Dr B. K. Mukherjee, Director, Central Sugarcane Research Station, Shahjahanpur
8. Dr T. R. Sheshadri, Professor of Chemistry and Head of the Department of Chemistry, Delhi University, Delhi
9. Shri P. D. Karunakar, Principal, Agricultural College, Coimbatore
10. Dr P. K. Dubey, Micro-biologist, Government of West Bengal, Calcutta
11. Dr A. N. Puri, Retired Soil Physicist, Punjab, 13 Shri Niketan, Queens Road, Bombay

Ex-officio members

12. Dr R. C. Hoon, Deputy Director, Hira Kund Research Station, Sambalpur
13. Head of the Division of Chemistry, Indian Agricultural Research Institute, New Delhi
14. Officers of the Council

AGRONOMY (INCLUDING AGRICULTURAL ENGINEERING AND DEVELOPMENT) COMMITTEE

1. Shri Kalidas Sawhney, Secretary, Indian Central Cotton Committee, Bombay (Chairman)
2. Dr P. Parija, Pro-Chancellor, Utkal University, Cuttack
3. Dr A. T. Sen, Member, Public Service Commission, West Bengal, Calcutta
4. Dr D. A. Gadkari, Joint Director of Agriculture (Engineering), Bombay State, Poona
5. Shri J. Bannerjee, Deputy Inspector General of Forests, Ministry of Food and Agriculture, Government of India, New Delhi
6. Shri B. N. Handa, Principal, Veterinary College, Hissar
7. Dr R. Sankaran, Joint Director of Agriculture (Research), Madhya Bharat, Gwalior
8. Dr R. J. Kalamkar, Director of Agriculture, Madhya Pradesh, Nagpur
9. Dr T. J. Mirchandani, Head of the Division of Agronomy, Indian Agricultural Research Institute, New Delhi
10. Shri R. V. Ramiah, Head of the Division of Agricultural Engineering, Indian Agricultural Research Institute, New Delhi
11. Dr L. A. Ramdas, Director, Agricultural Meterology, Poona

12. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, New Delhi

Ex-officio members

13. Officers of the Council

ANIMAL BREEDING COMMITTEE

1. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi (Chairman)
2. Shri H. B. Shahi, Officer on Special Duty, Department of Animal Husbandry, U. P., Lucknow
3. Dr R. L. Kaura, Director of Animal Husbandry, U.P., Lucknow
4. Shri G. B. Singh, Director of Animal Husbandry and Veterinary Services, Orissa, Cuttack
5. Dr P. Bhattacharya, Head of the Division of Animal Genetics, Indian Veterinary Research Institute, Izatnagar
6. Dr M. D. Patel, Director, Institute of Agriculture, Anand
7. The Superintendent, Government Livestock Farm, Hissar
8. The Director, Veterinary Department, Hyderabad (Dn.)
9. Shri V. L. Wazir, Director, Civil Veterinary Department, Jammu and Kashmir, Srinagar
10. Shri S. K. Sen, Director of Animal Husbandry, Bihar, Patna

Ex-officio members

11. Head of the Division of Agronomy, Indian Agricultural Research Institute, New Delhi
12. The Registrar, Central Herds Books, New Delhi
13. Officers of the Council

ANIMAL NUTRITION COMMITTEE

1. Dr N. D. Kehar, Head of the Division of Animal Nutrition, Indian Veterinary Research Institute, Izatnagar (Chairman)
2. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore
3. Major T. Murari, Joint Director of Animal Husbandry, Madras, Triplicane Post Office, Madras
4. Dr G. Sankaran, Indian Penicillin Committee, Bombay
5. Dr Lal Chand Dharmani, Agricultural Chemist, Agriculture Department, Government of Punjab, Jullundur City
6. Dr S. K. Talpatra, Professor of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Mathura (U. P.)
7. Dr S. P. Srivastava, Research Officer, Animal Nutrition Section, Government Cattle Farm, Behrari, Jhansi
8. Dr V. N. Patwardhan, Director Nutrition Research Laboratory, Coonoor (South India)

9. Dr P. G. Pande, Principal, College of Animal Husbandry and Veterinary Science, Mathura

Ex-officio members

10. The Director, Indian Veterinary Research Institute, Izatnagar
11. Officers of the Council

Dairy Science Committee

1. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore (Chairman)
2. Shri B. N. Bannerjee, Indian Institute of Science, Bangalore
3. Prof. J. N. Warner, Allahabad Agricultural Institute, Allahabad
4. S. Harbans Singh, Assistant Cattle Utilization Adviser, Ministry of Food and Agriculture, New Delhi
5. Shri N. K. Bhargava, Dairy Development Officer, U. P., Lucknow
6. The Director of Remounts, Veterinary and Farms, Q. M. G. Branch, Army Headquarters, New Delhi
7. Shri D. N. Khurody, Milk Commissioner, Wakefield House, Ballard Estate, Fort, Bombay
8. Dr L. C. Sikka, Milk Commissioner-cum-Administrator, Government of West Bengal, Writers' Buildings, Calcutta
9. Shri Harjas Rai, Director of Animal Husbandry, Ajmer

Ex-officio members

10. Deputy Dairy Development Adviser to the Government of India, New Delhi
11. Assistant Cattle Utilization Adviser to the Government of India, New Delhi
12. Officers of the Council

Animal Diseases and Pests Committee

1. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar (Chairman)
2. Shri V. R. Rajagopalan, Director of Animal Husbandry, Madras
3. Shri L. Sahai, Director of Veterinary Services, Bombay State, Poona
4. Prof. M. Y. Mangrulkar, Director of Veterinary Services, Madhya Pradesh, Nagpur
5. Dr G. S. Thapar, Prof. of Zoology, University of Lucknow, Lucknow
6. Shri M. I. Malik, Director of Veterinary Services, Bihar, Patna
7. The Director of Remounts, Veterinary and Farms, Q.M.G. Branch, Army Headquarters, New Delhi
8. Dr H. D. Srivastava, Research Officer (Helminthology), Indian Veterinary Research Institute, Izatnagar

9. Shri M. R. Dhanda, Research Officer, Indian Veterinary Research Institute, Mukteswar
10. Dr P. M. Narayanaswami Naidu, Director of Animal Husbandry, Mysore State, Bangalore
11. Shri P. C. Bannerjee, Assistant Director of Veterinary Services, West Bengal, Calcutta
12. Dr B. C. Basu, Research Officer (Entomology), Indian Veterinary Research Institute, Izatnagar
13. Dr H. N. Ray, Research Officer (Entomology), Indian Veterinary Research Institute, Izatnagar

Ex-officio members

14. Officers of the Council

STATISTICAL COMMITTEE

1. Professor P. C. Mahalanobis, Honorary Statistical Adviser, Cabinet Secretariat, New Delhi
2. Dr R. J. Kalamkar, Director of Agriculture, Madhya Pradesh, Nagpur
3. Shri R. S. Koshal, Statistician, Department of Agriculture, Bombay State, Poona-5
4. Dr K. Kishan, Chief Statistician, Agriculture Department, Uttar Pradesh, Lucknow
5. Professor V. D. Thawani, Professor of Statistics, Gauhati University, Gauhati
6. Dr N. S. R. Sastry, Director of Statistics, Reserve Bank of India, Bombay
7. Dr U. S. Nair, Superintendent, Census Operations, Travancore-Cochin, Trivandrum
8. Dr S. R. Sen, Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India, New Delhi
9. Dr C. R. Rao, Indian Statistical Institute, Calcutta

Ex-officio members

10. Officers of the Council

APPENDIX XIV

COMMODITY COMMITTEES

Foodgrains Committee

1. Shri C. Bali Reddi, Cumbum P. O., Kurnool, Madras
2. Shri Ashutosh Bhattacharya, Bengal Rice Mills and Merchants Association, 30 Kabir Road, Calcutta
3. Shri P. R. Deshmukh, M. P., District Amraoti, (Madhya Pradesh)
4. Shri V. S. Thyagaraja Mudaliar, Landlord, Vadapathi, Tanjore, Madras
5. Sardar Iqbal Singh, Aira Estate, Kheri District, (U.P.)
6. Director of Agriculture, Madhya Bharat, Gwalior
7. Shri G. N. Rangaswami Iyenger, Rama Mandiram, 4 Ramaswami Street, Thyagarjanagar, Madras-17
8. Shri T. R. Mehta, Economic Botanist to the Government of Uttar Pradesh, Kanpur
9. Shri S. Ramanujam, Director, Central Rice Research Institute, Cuttack
10. Dr V. N. Pathwardhan, Director, Nutrition Research Laboratory, Coonoor (S. I.)
11. Director of Agriculture, Rajasthan, Jaipur
12. Shri P. D. Dixit, Assistant Director of Agriculture (Seed Multiplication Scheme), Government of Orissa, Cuttack

Ex-officio members

13. Shri K. R. Sontakay, Director of Storage, Ministry of Food and Agriculture, New Delhi
14. Officers of the Council

Medicinal Plants Committee

1. Shri R. L. Badhwar, Forest Research Institute, Dehra Dun
2. Dr K. Biswas, Superintendent, Botanical Garden, Calcutta
3. Dr B. M. Ghose, Messrs. Union Drug Co. Ltd., 285 Bowbazar Street, Calcutta (Representative of the Pharmaceutical Industry in India)
4. Dr B. Mukherjee, Director, Central Drugs Control Laboratory, Calcutta
5. Dr K. Ganapathi, Haffkine Institute, Bombay (Representative of the Haffkine Institute)
6. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
7. Dr M. S. Verma, Principal, Ayurvedic College, Banaras
8. Director/Asstt. Director, Central Drug Research Institute, Lucknow

9. Dr S. Dutta, Director, Indian Veterinary Research Institute, Izatnagar
10. Shri P. M. Nabar, Representative of the Ministry of Health, Government of India, New Delhi
11. Col. R. N. Chopra, Director, Central Drug Research Laboratory, Jammu Tawi

FRUITS AND VEGETABLES COMMITTEE

1. Fruit Specialist to the Government of Punjab, Jullundur
2. Horticulturist to the Government of Madhya Pradesh, V. I. Building, Maharajbagh, Nagpur
3. Shri K. C. Naik, Deputy Director of Agriculture, Madras, Chepauk (Madras)
4. The Deputy Director of Horticulture, Uttar Pradesh, Butler Palace, Lucknow
5. Horticulturist to the Government of Bombay, Poona
6. Director of Agriculture, Jammu and Kashmir, Srinagar
7. Shri M. L. Garg, c/o L. R. Brothers, Seedsmen and Nurserymen Saharanpur (U. P.)
8. Shri Krishna Prasad Bhargava, Proprietor, G. G. Fruit Preserving Factory, Agra (U. P.)
9. Dr G. S. Cheema, 13 West Market Road, Kirkee, Poona-3
10. Shri V. Hanumanthu Naidu, Ellampet P. O., Cuddapah Distt. (Madras)
11. Shri N. Y. Kashalkar, Chief Production Manager, Central Hindustan Cold Starage and Orange Co., Ltd., Post Box No. 53, Moti Bagh, Nagpur
12. Dr S. Ramanujam, Director, Central Rice Research Institute, Cuttack
13. Shri S. C. Bhattacharjee, Horticultural Development Officer, Assam, Gauhati

Ex-officio members

14. Dr D. V. Karmarkar, Technical Adviser (Representative of the Ministry of Food and Agriculture)
15. Dr Girdhari Lal, Assistant Director, Central Food Technological Research Institute, Mysore
16. Agricultural Marketing Adviser to the Government of India or his representative, Ministry of Food and Agriculture, New Delhi
17. Head of the Division of Botany, Indian Agricultural Research Institute, New Delhi
18. Officers of the Council

HIDES AND SKINS COMMITTEE

1. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar (Chairman)

2. Shri K. S. Choudhri, Assistant Director, Leather Research Institute, Madras
3. Shri N. Ramalingeshwara Rao, Madras
4. Shri T. Jiyyar Das, Vice-President All India Depressed Classes League, Nidubrolu, S. I. Rly.
5. Principal, Institute of Leather Technology, Madras
6. Shri B. M. Das, Leather Adviser, Calcutta
7. Mr. O. G. Mayor, (Representative of the Calcutta Hides and Skins Shippers Association, Calcutta)
8. Representative, Kashmir Export Co., Jammu and Kashmir State
9. Shri B. N. Soni, Indian Veterinary Research Institute
10. Representative of the Arahthdar Hide Merchants Association, Kanpur
11. Shri Mohd. Hamza, Tanners Federation of India, Kanpur

Ex-officio members

12. A representative of the Ministry of Commerce, Government of India
13. A representative of the Ministry of Industry and Supply, Government of India
14. Agricultural Marketing Adviser to the Government of India
15. Officers of the Council

WOOL COMMITTEE

1. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi (Chairman)
2. Dr B. K. Vaidya, Textile Research Institute, Ahmedabad
3. Mr. A. Staynes, International Wool Secretariat, New Delhi
4. Shri Bhup Kishore Sinha, M/s. Vijasinh and Co., Wool Exporters. Fazilka (Representative of Beawar Wool Merchants Association)
5. Shri Vijay Sinh, M/s. Vijasinh and Co., 13/21, 3rd Pinjrapol Lane, Bombay (Representative of the Bombay Wool Merchants Association)
6. Master Mohan Lal Mandot, Beawar, Ajmer (Representative of Beawar Wool Merchants Association)
7. Shri N. L. Narayan, Sheep and Wool Development Officer, Rajasthan, Jaipur
8. Shri Manoobhai Doongursee, c/o Doongursee and Sons, Bombay
9. Shri Sirey Mal Kanther, Wool Merchant, Pali, Marwar
10. Director, Indian Standards Institution, Delhi
11. Superintendent, Government Livestock Farm, Hissar
12. Shri S. S. Khot, Sheep and Wool Development Officer, Bombay, Poona

Ex-officio members

13. Dr A. S. Sharma, Under Secretary, Ministry of Commerce, Government of India, New Delhi

14. Shri M. N. Kale, Director General, Directorate General of Industries and Supplies, New Delhi
15. Agricultural Marketing Adviser to the Government of India, New Delhi
16. Officers of the Council

LIVESLOCK, MILK AND POULTRY COMMITTEE

1. Shri J. N. Mankar, Bombay Humanitarian League, Bombay
2. Rai Bajrang Bahadur Singh, Lucknow
3. Shri Nalla Senapathi Sarkarai Manradiar, Pattagar of Palayakottai, Coimbatore
4. Shri Satish Chandra Das Gupta, Khadi Pratisthan, P. O. Sodepur
5. Shri Y. M. Parnerkar, Government of Madhya Pradesh, Nagpur
6. Shri Heera Lal Patel, Livestock Development Officer, Kotah (Representative of the Rajasthan Union)
7. Shri A. E. Slater, Etah (U. P.)
8. Shri Purviz Nariman Kothawala, Ahmedabad
9. Shri Udhab Pattnaik, Orissa, Cuttack
10. Shri Dharma Lal Singh, Darbhanga, Bihar
11. Shri T. N. Singh, Member of the House of People, Banaras (U. P.)
12. Shri S. G. Iyer, Indian Veterinary Research Institute, Izatnagar

Ex-officio members

13. Dairy Development Adviser to the Government of India, New Delhi
14. Director General of Health Services, Government of India, New Delhi
15. Agricultural Marketing Adviser to the Government of India, New Delhi
16. Officers of the Council

AGRICULTURE COMMITTEE

1. Dr Hem Singh Pruthi, Plant Protection Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi (Chairman)
2. Dr E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi
3. Officer-in-Charge, Northern Regional Bee Research Station, Katrain, Punjab
4. Officer-in-Charge, Southern Regional Bee Research Station, Coimbatore, Madras
5. Forest Entomologist, Forest Research Institute, Dehra Dun
6. Representative, All India Bee Keepers Association, P. O. Ramgarh, Distt. Nainital
7. Representative, All India Khadi and Cottage Industries Board, Ministry of Commerce and Industry, Government of India, New Delhi

Ex-officio Member

8. Animal Husbandry Commissioner with the Government of India, New Delhi or his representative

SPICES ENQUIRY COMMITTEE

1. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi (Chairman)
2. Shri A. K. Menon, Amblakat House, Chalapuram, Calicut
3. Shri N. Alexander, Sreevalsam, Vanchiyoor, Trivandrum
4. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
5. Dr M. B. Ghatge, Agricultural Marketing Adviser to the Government of India, New Delhi
6. Dr T. G. Shirname, Director of Agriculture, Government of Bombay, Poona
7. Shri C. M. John, Director of Research, Central Cocoanut Research Station, Kasaragode
8. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi

APPENDIX XV

Publications Committee

1. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
2. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
3. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, New Delhi
4. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
5. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar (Uttar Pradesh)
6. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore-1
7. Dr H. S. Pruthi, Plant Protection Adviser to the Government of India, New Delhi
8. Dr S. B. Singh, Director of Agriculture, U. P., Lucknow
9. Shri H. B. Shahi, Animal Husbandry Commissioner with the Government of Uttar Pradesh, Lucknow
10. Prof. P. Parija, Pro-Chancellor, Utkal University, Cuttack
11. Shri A. R. Vyas, Director of Publicity, Ministry of Food and Agriculture, Government of India, New Delhi
12. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research, New Delhi
13. Dr U. N. Chatterji, Editor, Indian Council of Agricultural Research, New Delhi

Editorial Boards

Agriculture and Animal Husbandry in India

1. Vice-President, Indian Council of Agricultural Research, New Delhi
2. Agricultural Commissioner with the Government of India, New Delhi
3. Animal Husbandry Commissioner with the Government of India, New Delhi
4. Secretary, Indian Council of Agricultural Research, New Delhi
5. Editor, Indian Council of Agricultural Research, New Delhi

Occasional Publications

1. Agricultural or Animal Husbandry Commissioner with the Government of India, New Delhi
2. Secretary, Indian Council of Agricultural Research, New Delhi
3. Editor, Indian Council of Agricultural Research, New Delhi

Indian Journal of Agricultural Science

1. Agricultural Commissioner with the Government of India, New Delhi
2. Director, Indian Agricultural Research Institute, New Delhi
3. Shri M. S. Randhawa, Development Commissioner, Punjab
4. Statistical Adviser, Indian Council of Agricultural Research, New Delhi
5. Editor, Indian Council of Agricultural Research, New Delhi

Indian Journal of Veterinary Science and Animal Husbandry

1. Animal Husbandry Commissioner with the Government of India, New Delhi
2. Director, Indian Veterinary Research Institute, Mukteswar
3. Director, Indian Dairy Research Institute, Bangalore
4. Shri L. Sahai, Director of Veterinary Services, Bombay State, Poona
5. Editor, Indian Council of Agricultural Research, New Delhi

Kheti

1. Vice-President, Indian Council of Agricultural Research, New Delhi
2. Assistant Agricultural Commissioner with the Government of India, New Delhi
3. Assistant Animal Husbandry Commissioner with the Government of India, New Delhi
4. Secretary, Indian Council of Agricultural Research, New Delhi
5. Editor, Indian Council of Agricultural Research, New Delhi
6. Assistant Editor, Kheti, Indian Council of Agricultural Research, New Delhi

Indian Farming

1. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research (Chairman)
2. Dr B. N. Uppal, Agricultural Commissioner with the Government of India
3. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India
4. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
5. Shri A. R. Vyas, Director of Publicity, Ministry of Food and Agriculture
6. Mr. J. Malcolm Orchard, Agricultural Information Adviser
7. Dr K. Mitra, Assistant Director-General of Health Services, Ministry of Health
8. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India
9. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research
10. Shri D. M. Anand, Extension Information Officer
11. Dr U. N. Chatterjee, Deputy Director (Publicity), Indian Council of Agricultural Research (Chief Editor)

APPENDIX XVI

Ad hoc Committees and Sub-Committees

Ad hoc Committee on Milk Costing

1. Dr V. G. Panse, Statistical Adviser, Indian Council of Agricultural Research, New Delhi (Chairman)
2. Animal Husbandry Commissioner with the Government of India, New Delhi
3. Prof. J. N. Warner, Head of the Department of Dairying, Allahabad Agricultural Institute, Allahabad
4. Dr S. R. Sen, Economic and Statistical Adviser, Ministry of Food and Agriculture, Government of India, New Delhi
5. Shri H. C. Varma, Deputy Dairy Development Adviser to the Government of India, Ministry of Food and Agriculture, New Delhi
6. Shri Y. U. Salpekar, Milk Costing Officer, Bombay

Ex-officio members

Secretary, Indian Council of Agricultural Research, New Delhi

Ad hoc Committee Appointed to Revise the Scheme of Schools of Research in Entomology and Mycology

1. Shri T. S. Venkatraman, 56 Thyagaraja Road, Thyagaraja Nagar. Madras (Chairman)
2. Dr B. N. Uppal, Agricultural Commissioner with the Government of India, New Delhi
3. Dr B. Visawa Nath, 8A/85 W. E. A., Karol Bagh, New Delhi
4. Plant Protection Adviser with the Government of India, Shahjahan Road, New Delhi
5. Dr E. S. Narayanan, Head of the Division of Entomology, Indian Agricultural Research Institute, New Delhi
6. Assistant Agricultural Commissioner with the Government of India, Indian Council of Agricultural Research, New Delhi (Secretary)

Sub-Committee on Indigenous Drugs

1. Dr S. Datta, Director, Indian Veterinary Research Institute, Mukteswar (Chairman)
2. Dr B. Mukherji, Director, Central Drug Research Institute, Lucknow
3. Dr K. Biswas, Superintendent, Indian Botanical Gardens, Calcutta
4. Shri C. K. Velayudhan Nayar, Madras Veterinary College, Madras
5. Shri V. Srinivasan, Bihar Veterinary College, Patna

6. Shri A. Krishnaswamy, 1/18, Luz Avenue, Mylapore, Madras
7. Dr Visweswara Sastry, College of Indigenous Medicines, Madras
8. Shri P. L. Mehta, Director, Central Institute for Research on Indigenous Medicines, Jamnagar
9. Dr Shukla, Retired Health Officer, Ajmer, Shukla Bhawan, Pushkar Road, Ajmer

HELMINTHOLOGICAL SUB-COMMITTEE OF THE ANIMAL DISEASES AND PESTS COMMITTEE

1. Dr H. D. Srivastava, Research Officer (Helminthiasis), Indian Veterinary Research Institute, Izatnagar
2. Dr G. S. Thapar, Professor of Zoology, Lucknow University, Lucknow
3. Shri N. Anantraman, Research Officer (Helminthiasis), Madras Veterinary College, Madras
4. Dr B. V. Kulkarni, Officer-in-Charge, Liverfluke Central Scheme, Nizamabad (Hyderabad)
5. Shri S. K. Bhaduri, Assistant Disease Investigation Officer, West Bengal Veterinary College, Belgachia, Calcutta
6. Shri Lakshmi Sahai, Director of Veterinary Services, Bombay, Bombay

APPENDIX

Statement showing location, date of sanction, cost and

State	Location of project	Area in sq. miles	Population	Principal town	Reasons for selection
(1)	(2)	(3)	(4)	(5)	(6)
1. Bombay	(1) Training centre at Agricultural Institute, Anand	About 100 villages	279,000	Anand	Tract assured of rainfall, irrigation facilities, soil fertile. Variety of crops grown
	(2) Project in Charotar tract in Gujerat	278 sq. miles			
2. Madhya Pradesh	Village Sindewahi in District—Chanda	100 villages 155 sq. miles	43,338	Brahmapuri, District—Chanda	Tract already under intensive development of G. M. F., better irrigation facilities, buildings available at farm, etc.
3. Uttar Pradesh	Bakhshi-Ka-Talab near Lucknow	200 villages 79·74 sq. miles	51,440	Lucknow	Typical rural area and proximity to H.Q. would mean better supervision and building facilities, etc.
4. West Bengal	Burdwan Farm	100 villages 62 sq. miles	54,000	Burdwan	Suitable soil condition, potentialities of introduction of double and triple cropping and irrigation facilities
5. Mysore	Malavath Taluk, District—Mandya	100 villages 178 sq. miles	110,485	Mandya	Irrigation facilities, availability of building and other farm equipment and staff
6. Assam	Rangiya in District Kamrup	113 villages 113·9 sq. miles	52,000	Rangiya	Panchayat, which has in its orbit 24 villages and also a farm. Area typical of the State and having potentialities for improvement
7. Bihar	Bihta Bikram and Naubatpur Police Stations	100 villages 66 sq. miles	111,740	Patna	Canal and T. W. irrigation facilities, fertile soil, sugarcane growing area
8. Orissa	Kendrapara, Cuttack	141 villages 100 sq. miles	..	Kendrapara	Intensive block already in existence, building and irrigation facilities also available
9. Hyderabad	Kukatpalli, 5-6 miles from Hyderabad	120 villages 256 sq. miles	120,847	Hyderabad	High water table, soils suitable for irrigated and intensive farming, presence of large number of milch animals, proximity to market, etc.
10. PEPSU	Bhadson, PEPSU, Nabha	139 villages 148 sq. miles	42,854	Nabha	Intensive cultivation, area having irrigation facilities, proximity to Agricultural Department Head Quarters
11. Madhya Bharat	Mhow, District—Indore	100 villages 231 sq. miles	56,762	Mhow	..
12. Travancore-Cochin	Mavelikara, District—Quilon	45 Pakuthies 275 sq. miles	663,446	Mavelikara	Area typical of Coastal region inter-spersed with lagoons and water-ways, heavy rainfall, easy accessibility by road
13. Vindhya Pradesh	Nowgong and neighbouring areas	142 villages 200 sq. miles	39,300	Nowgong	People in the locality hardworking, block easily accessible, irrigation problem can be tackled in future by barraging rivers
14. Bhopal	Within a radius of 8 miles from Obeidullahganj	134 villages 187 sq. miles	23,950	Obeidullahganj	Fertile bed of Bhopal lake, easy accessibility of soils, irrigation facilities, intensive block for Grow More Food work
15. Himachal Pradesh	Strip between Kufri and Narkanda	275 villages 91·8 sq. miles	26,796	Theog	Accessibility and fertility of soils, suitability for growing fruits and potatoes, irrigation facilities available, also facilities for obtaining improved seeds and plants

XVII

date of start of the Pilot Development Projects

Date of formal sanction	Date of starting	Non-recurring	Recurring	Total	To Ford Foundation	To Central Government	To State Government
(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
19-2-1952	15-6-1952	1,65,000	5,82,200	7,47,200*	5,53,740	96,730	96,730
10-5-1952	16-6-1952	58,100	3,33,420	3,91,520	2,07,600	91,960	91,960
4-4-1952	3-5-1952	57,900	5,03,500	5,61,400	2,08,200	92,350	2,60,850
23-2-1952	1-6-1952	56,000	3,26,690	3,82,690	1,88,150	87,270	1,07,270
23-2-1952	15-5-1952	56,000	3,39,100	3,95,100	2,07,000	94,050	94,050
23-2-1952	1-4-1952	56,000	3,33,100	3,89,100	2,06,900	91,550	91,550
23-2-1952	22-4-1952	55,200	3,54,500	4,09,700	2,14,800	97,450	97,450
16-4-1952	29-4-1952	53,750	3,56,250	4,10,000	2,14,900	97,550	97,550
1-4-1952	23-4-1952	47,100	3,51,000	3,98,100	2,06,300	95,950	95,950
25-2-1952	8-4-1952	66,500	4,01,800	4,68,300	2,39,100	1,14,600	1,14,600
16-4-1952	20-5-1952	56,000	3,29,200	3,85,200	2,05,200	90,000	90,000
31-5-1952	..	56,000	3,48,800	4,04,800	2,13,000	95,000	95,000
2-6-1952							
23-4-1952	26-8-1952	51,000	3,51,700	4,02,700	2,09,700	96,500	96,500
16-4-1952	1-6-1952	51,000	3,45,300	3,96,300	2,08,300	94,000	94,000
17-3-1952	1-10-1952	60,400	4,14,060	4,74,460	2,43,900	1,15,280	1,15,280

* This includes cost of Training Centre as well.

APPENDIX

Statement showing number of Training Centres sanctioned, persons trained,

Serial No.	State	Location	Date of Starting	No. of Trainees	
				Trained	Under Training
1.	Bombay . . .	Agricultural Institute, Anand	15-6-52	17	47
2.	West Bengal . .	Burdwan Farm . .	1-6-52	36	46
3.	U. P. . . .	Bakshi-ka-Talab .	3-5-52	60	60
4.	M. Pradesh . .	Sindewahi . .	16-6-52	38	31
5.	Mysore . . .	Visvesvaraya Canal, Farm	12-5-52	35	32
6.	Assam . . .	Jorhat . . .	20-11-52	..	46
7.	Bihar . . .	Patna . . .	6-10-52	..	95
8.	,, . . .	Muzaffarpur . .	6-10-52	..	89
9.	Bhopal . . .	Bairagarh . .	16-8-52	..	59
10.	Bombay . . .	Kolhapur . .	1-12-52	..	57
11.	,, . . .	Arabhavi . . .	10-12-52	..	29
12.	H. Pradesh* . .	Mahhobra . .	..	..	..
13.	Hyderabad . .	Hyderabad . .	10-8-52	67	52
14.	M. Bharat . .	Antri	30-11-52	..	63
15.	M. Pradesh . .	Powarkheda . .	3-11-52	..	78
16.	Madras . .	Gandhigram . .	8-12-52	..	31

* Agricultural Extension Commissioner visited the State recently and had consultations with the C. M. All preliminary steps have been taken and the centre is expected to start as soon as the Principal returns to Himachal Pradesh after his visit to Nilokheri.

XVIII

and those under training at these Centres upto March, 1953

Serial No.	State	Location	Date of Starting	No. of Trainees	
				Trained	Under Training
17.	Madras	Parli (Palaghat)	8-12-52	..	30
18.	,,	Peddapuram	8-12-52	..	38
19.	Orissa	Bolangir	14-8-52	62	71
20.	PEPSU	Nabha	1-8-52	69	82
21.	Punjab	Batala	1-8-52	104	103
22.	,,	Nilokheri	3-7-52	77	70
23	Rajasthan	Kotah	14-11-52	..	64
24.	Saurashtra	Junagarh	18-6-52	15	..
25.	Travancore-Cochin	Mavelikara	6-4-53	Information awaited	..
26.	U. P.	Hawalbagh	Information awaited	..	..
27.	,,	Chirgaon	,,	,,	..
28.	,,	Ghazipur	,,	,,	..
29.	,,	Gorakhpur	,,	,,	..
30.	,,	Bulandshahr	,,	,,	..
31.	V. Pradesh	Nowgong	16-2-53	..	41
32.	West Bengal	Chinsurah	Information awaited	,,	..
33.	,,	Fulia	,,	,,	..
34.	,,	Suri	,,	,,	..
			TOTAL	580	1,314

APPENDIX XIX

Indian Council of Agricultural Education

1. Shri Rafi Ahmed Kidwai, Minister for Food and Agriculture, Government of India, New Delhi (Chairman)
2. Dr Panjabrao S. Deshmukh, Minister for Agriculture, Government of India, New Delhi
3. Shri K. R. Damle, Vice-President, Indian Council of Agricultural Research, New Delhi
4. Dr B. N. Uppal, Agricultural Commissioner with the Government, of India, Indian Council of Agricultural Research, New Delhi
5. Shri S. C. Roy, Agricultural Extension Commissioner with the Government of India, Indian Council of Agricultural Research, New Delhi
6. Shri P. N. Nanda, Animal Husbandry Commissioner with the Government of India, Indian Council of Agricultural Research, New Delhi
7. Shri M. D. Chaturvedi, Inspector-General of Forests, Ministry of Food and Agriculture, Government of India, New Delhi
8. Shri C. R. Ranganathan, President, Forest Research Institute, Dehra Dun
9. Shri R. S. Krishnaswami, Director General of Food, Ministry of Food and Agriculture, Government of India, New Delhi
10. Shri Humayun Kabir, Secretary, Ministry of Education, Government of India, New Delhi
11. The Secretary, Inter-University Board, New Delhi
12. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar (Uttar Pradesh)
13. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi
14. Dr K. C. Sen, Director, Indian Dairy Research Institute, Bangalore
15. Vice-Chancellor, Agra University, Agra
16. Vice-Chancellor, Allahabad University, Allahabad
17. Vice-Chancellor, Banaras University, Banaras
18. Vice-Chancellor, Bombay University, Bombay
19. Vice-Chancellor, Madras University, Madras
20. Vice-Chancellor, Gauhati University, Gauhati (Assam)
21. Vice-Chancellor, Delhi University, Delhi
22. Vice-Chancellor, Nagpur University, Nagpur
23. Vice-Chancellor, Punjab University, Solan, Simla

24. Vice-Chancellor, Osmania University, Hyderabad
25. Vice-Chancellor, Mysore University, Mysore
26. Vice-Chancellor, Andhra University, Waltair
27. Vice-Chancellor, Rajputana University, Jaipur
28. Vice-Chancellor, Gujrat University, Ahmedabad
29. Vice-Chancellor, Poona University, Poona
30. Vice-Chancellor, Calcutta University, Calcutta
31. Vice-Chancellor, Karnatak University, Dharwar
32. Vice-Chancellor, Bihar University, Patna
33. Principal, Agricultural College, Poona
34. Principal, Agricultural Institute, Allahabad
35. Director, Agricultural Institute, Anand
36. Principal, Agricultural College, Kanpur
37. Principal, Agricultural College, Sabour, Bihar
38. Principal, Agricultural College, Coimbatore
39. Principal, Agricultural College, Nagpur
40. Principal, Agricultural College, Ludhiana
41. Principal, Agricultural College, Hyderabad
42. Principal, Bengal Veterinary College, Calcutta
43. Principal, Veterinary College, Hissar
44. Principal, Veterinary College, Bombay
45. Principal, Veterinary College, Madras
46. Shri N. K. Sidhanta, Member, Union Public Service Commission, New Delhi
47. Dr Paul Karuth, Extension Adviser, Ministry of Food and Agriculture, New Delhi
48. Shri J. V. A. Nehemiah, Secretary, Indian Council of Agricultural Research (Secretary)

Standing Committee of the Indian Council of Agricultural Education

1. Dr B. P. Pal, Director, Indian Agricultural Research Institute, New Delhi (Chairman)
2. Dr T. J. Mirchandani, Principal, Central College of Agriculture, New Delhi
3. Dr B. L. Sethi, Principal, Agricultural College, Kanpur
4. Dr L. S. S. Kumar, Principal, College of Agriculture, Poona
5. Dr Amir Ali, Principal, University College of Agriculture, Osmania University, Hyderabad-Dn.
6. Dr S. Datta, Director, Indian Veterinary Research Institute, Izatnagar
7. Dr S. R. Chadha, Principal, Veterinary College, Bombay

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS				
Head of Account	Receipts during the year	Total	Grants	
			Original	Net
	Rs. as. p.	Rs. as. p.	Rs.	Rs.
I. Opening balance . .	..	4,21,810 14 1	31,000	28,000
II. Receipts under the Agricultural Produce Cess Act	..	42,60,502 0 0	9,000	5,600
III. Grants—				
(*a*) From the Indian States—				
(i) Travancore-Cochin .	30,000 0 0		24,000	25,000
(ii) Saurashtra .	20,000 0 0			
(iii) Kashmir . . .	5,000 0 0	55,000 0 0		
(*b*) From Central Government—			1,310	..
(i) For experimental Cow Dung Night Soil Plant	22,200 0 0		3,000	3,200
(ii) For livestock, fisheries	42,200 0 0			
(iii) For Co-ordinated Wheat Rust Scheme	77,156 0 0			
(iv) For preliminary enquiry of sample survey in cultivation holdings	8,000 0 0			
(v) For crop cutting experiments on jute	4,000 0 0		..	2,700
(vi) Japanese method of paddy cultivation.	61,500 0 0		17,350	9,000
(vii) Miscellaneous . .	36 0 0	2,15,092 0 0	10,000	11,300
(*c*) The States share of food bonus of crop cutting experiments	2,17,519 0 0	2,17,519 0 0	..	300
IV. Interest from Investments— 2¾% loan, 1962 . .	26,059 8 0		..	100

XX

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
	Rs. as. p.	Rs. as. p.	
A. STANDING CHARGES			
1. Accounts & Audit	27,981 14 6	(+)18 1 6 (*a*)	(*a*) Inconsiderable.
2. Travelling allowance of non-official members of the Council	5,509 2 0	(+)90 14 0(*a*)	,,
3. Travelling alowance of members of the committees of the Advisory Board and of other persons invited to attend the meetings	23,446 1 0	1,553 15 0(*a*)	,,
4. T. A. of non-official members of the Board of Agriculture and Animal Husbandry in India.	..	..	,,
5. Miscellaneous . .	3,170 5 0	29 11 0(*a*)	(*a*) Inconsiderable.
B. RESEARCH, TRAINING AND PUBLICITY UNDER DIRECT CONTROL OF I. C. A. R.			
(i) *Agriculture*			
1. Indian Institute of Fruit Technology	2,646 4 0	53 12 0(*a*)	,,
2. Description of different varieties of fruits	9,126 2 6	126 2 6(*a*)	,,
3. Abstraction of horticultural literature	11,366 12 0	(—)66 12 0(*a*)	,,
4. Manual on fruit preservation in India	300 0 0	..	,,
5. A Hand Book on Indian Agriculture	74 1 0	(+)25 15 0(*a*)	(*a*) Inconsiderable

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS

Head of Account	Receipts during the year	Total	Grants	
			Original	Net
IV. Interest for Investment —*contd.*	Rs. as. p.	Rs. as. p.	Rs.	Rs.
3% loan, 1963-65 . .	49,361 4 0			
3% 2nd Victory Loan, '59-61	14,962 8 0		..	300
2¼% loan, 1954 . .	33,903 8 0			
3% loan, 1957 . . .	55,546 12 0			
2½% loan, 1955 . .	39,827 8 0			
Fixed deposits, etc. . .	35,525 13 0	2,55,186 13 0	11,000	8,000
V. Miscellaneous Receipts—				
(i) Receipts realised from sale of milk and coupons	8,99,504 7 9		1,000	240
(ii) Receipts realised from schemes	1,76,892 14 1			
(iii) Receipts on account of unspent balance of grants made by the Council	43,923 14 8		2,000	..
(iv) Miscellaneous—				
From other sources .	28,118 10 6	11,48,439 15 0	76,100	9,500
For Publicity Fund .	18,000 0 0	18,000 0 0	26,920	20,600
VI. Debts and Remittances—			400	..
1. Deposits of I.C.A.R. Provident Fund—				
(*a*) Subscription . . .	61,540 5 0		2,000	..
(*b*) Repayment of advances from subscription	654 0 0			
(*c*) Interest on advances	17 12 0		1,000	..
(*d*) Council's contributions (less paid)	18,336 11 0		1,000	..

XX—*contd.*

Council of Agricultural Research for the Year 1952-53—contd.

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
6. Revision of Hand book of Statistics for use in plant breeding and agricultural problems	246 1 0	(+)53 15 0(*a*)	(*a*) Inconsiderable
(ii) *Animal Husbandry*			
1. Characteristics of grey breeds	10,169 2 0	(—)2,169 2 0(*b*)	(*b*) Excess due to the payment of unanticipated outstanding liabilities
2. Monograph on "Chemotherapy of animal typanosomiasis"	240 8 0	(—)0 8 0(*a*)	(*a*) Inconsiderable
3. Monograph on 'Helminth Parasites of Domesticated Animals in India'	..	..	..
4. Cost of milk production	9,473 10 3	(+)26 5 9(*a*)	(*a*) Inconsiderable
5. Pilot Key Village Scheme, Delhi	18,344 7 0	(+)2,255 9 0(*c*)	(*c*) Payment of outstanding bills made in the next financial year
6. Monograph on 'Maintenance of Farm Animals in Health'	..	..	..
7. Manual on 'Preparation of Animals for Indian Markets'	..	..	..
8. Manual on 'Breeding of Farm Animals in India'	..	..	..
9. Monograph on 'Statistical Methods in Animals Husbandry'	..	..	..

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS				
Head of Account	Receipts during the year	Total	GRANTS	
			Original	Net
	Rs. as. p.	Rs. as. p.	Rs.	Rs.
(*e*) Lapse and forfeitures	Nil.			
(*f*) Interest from investment	1,655 11 0		1,000	..
(*g*) Miscellaneous . .	192 6 0	92,396 13 0		
2. Loans and advances to Councils servants—			17,050	..
(*a*) For purchase of conveyance—			19,800	6,900
(i) Motor Car Advances .	..			
(ii) Motor Cycle advances	160 0 0		33,340	25,600
(iii) Bicycle advances .	1,490 8 0			
(iv) Miscellaneous advances	..	1,650 8 0	3,15,000	1,55,500
(*b*) For other purposes .	..	..	..	44,000
			16,000	12,300
3. Other deposits and advances repayable—			..	4,800
(*a*) Library Deposits . .	..		..	8,100
(*b*) Permanent advances .	..		..	1,50,400
(*c*) Caution money deposits	..		60,000	..
(*d*) Suspense . . .	2,678 15 3			
(*e*) Other deposits . .	24,120 2 0	26,799 1 3	..	..
4. Remittances—			..	5,600
Of G. P. and other funds .	1,564 4 0		..	1,900

XX—*contd.*

Council of Agricultural Research for the Year 1952-53—contd.

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry* —contd.	Rs. as. p.	Rs. as. p.	
10. Inheritance of quantitative characteristics and laying qualities in birds	..	..	..
11. Camel Breeding, I. C. A. R.	..	..	..
12. Award of fellowships in A. H. subjects, I. C. A. R.	11,547 10 0	(—)4,647 10 0(*d*)	(*d*) Demands for funds from States received late in the year
(iii) *Miscellaneous*			
1. Library . .	25,602 10 1	(—)2 10 1(*a*)	(*a*) Inconsiderable
2. Co-ordinated crop cutting experiments	1,76,417 15 9	(—)20,917 15 9(*b*)	(*b*) Excess due to the payment of unanticipated outstanding liabilities
3. Integrated publicity work	44,568 3 6	(—)568 3 6(*a*)	(*a*) Inconsiderable
4. Statistical analysis of data collected on breeding scheme at I. D. R. I.	13,860 6 3	(—)1,560 6 3(*b*)	(*b*) Excess due to the payment of unanticipated outstanding liabilities
5. Statistician from F. A.O. for teaching	16,982 15 0	(—)12,182 15 0(*b*)	,,
6. Co-ordination of Research	8,219 4 0	(—)119 4 0(*a*)	(*a*) Inconsiderable
7. Cost of the office of I. C. A. R.	1,50,400 0 0	..	..
8. Building of the I. C. A. R.	..	..	..
9. Crop cutting experiments on oil seeds, U. P. & Madras	5,742 0 0	(—)142 0 0(*a*)	(*a*) Inconsiderable
10. Crop cutting experiments on jute	1,784 9 0	(+)115 7 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS				
Head of Account	Receipts during the year	Total	Grants	
			Original	Net
IV. Debts and Remittances —*concld.*	Rs. as. p.	Rs. as. p.	Rs.	Rs.
4. Remittances—*contd.*				
Of Income Tax . . .	3,056 13 0		..	56,800
Of Misc. Recoveries . .	2,664 8 0	7,285 9 0	..	6,500
Total Receipts and opening balance	..	67,19,682 9 4	1,59,180	9,59,200
Investments and Reinvestments	..	28,00,000 0 0	50	289
GRAND TOTAL . .	..	95,19,682 9 4	..	23,400
			..	11,700
			4,800	..
			970	..
			..	4,500
			..	3,900
			..	30,400
			..	400
			..	3,200

XX—*contd.*

Council of Agricultural Research for the Year 1952-53—contd.

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
Miscellaneous—contd.	Rs. as. p.	Rs. as. p.	
11. Editorial staff for Indian Farming	56,495 0 3	(+)304 15 9(*a*)	(*a*) Inconsiderable
12. Duplicating Section	6,388 6 9	(+)111 9 3(*a*)	,,
13. Village Projects, Delhi	122,087 7 3	(—)2,61,671 7 3(*b*)	(*b*)Excess due to the payment of unanticipated outstanding liabilities
14. Publication of abstracts	183 0 0	(+)17 0 0(*a*)	(*a*) Inconsiderable
15. Collection of marine fishery statistics	23,293 14 0	(+)106 2 0(*a*)	,,
16. Improvement of livestock statistics	11,946 9 0	(—)246 9 0(*a*)	,,
17. Fellowships in Statistics	..	..	..
18. Hand book on 'Indian Fodder and Forage Crops'	..	..	..
19. Grass Land Expert of the F.A.O.	4,578 1 0	(—)78 1 0(*a*)	(*a*) Inconsiderable
20. Indian Council of Agricultural and Veterinary education	4,128 6 0	(—)241 6 0(*a*)	,,
21. Publicity scheme	30,421 2 9	(—)21 2 9(*a*)	,,
22. Appointment of Mr. J. Malcolm Orchard under Point Four Programme	1,251 3 0	(—)851 3 0(*p*)	(*p*) Excess due to more tour undertaken than anticipated
23. (i) Publicity of Agricultural organization	7,927 11 3		
(ii) Japanese method of paddy cultivation	3,007 6 3		
	10,935 1 6	7,735 1 6(*x*)	(*x*) Excess expenditure incurred in connection with the purchase of cloth, printing, stationery and certain unanticipated items

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
		GRANTS	
Head of Account	Receipts during the year	Original	Net
		Rs.	Rs.
		..	14,100
		..	600
		..	4,800
		..	12,400
		7,570	8,900
		1,200	1,400
		10,000	8,200
		4,300	..
		500	5,200
		500	150
		1,000	6,900
		5,200	2,600
		940	9,200
		6,000	..
		3,900	..

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Miscellaneous*—contd.	Rs. as. p.	Rs. as. p.	
24. Spices Enquiry Committee	15,631 14 9	(—)1,531 14 9(*b*)	(*b*) Excess due to the payment of unanticipated outstanding liabilities
25. Preliminary enquiry of sample survey in cultivation holdings	555 3 0	(+)44 13 0(*a*)	(*a*) Inconsiderable
26. Fuel gas plant from cattle dung	4,877 6 0	(—)77 6 0(*a*)	,,
27. Extension Scheme	12,550 14 3	(—)150 14 3(*a*)	,,
28. Statistical analysis of data collected in sheep breeding schemes, Hissar and Mysore	8,617 14 0	(+)282 2 0(*a*)	,,
C. Grants-in-Aid			
(i) *Agriculture*			
(*a*) Rice			
1. Rice breeding, Bombay	1,362 0 0	(+)38 0 0(*a*)	,,
2. Rice breeding, Punjab	8,160 0 0	(+)40 0 0(*a*)	,,
3. Rice breeding, Coorg	..	..	
4. Rice breeding, Hyderabad	5,163 0 0	(+)37 0 0(*a*)	,,
5. Rice breeding, Kashmir	155 15 0	(—)5 15 0(*a*)	,,
6. Rice diseases, Madras	6,981 5 3	(—)81 5 3(*a*)	,,
7. Rice diseases, West Bengal	2,580 0 0	(+)20 0 0(*a*)	,,
8. Insects pests of paddy, West Bengal	9,190 0 0	(+)10 0 0(*a*)	,,
9. (*a*) Improvement of hill paddy, Orissa	..	..	
(*b*) Improvement of hill paddy, Assam	..	..	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		1,070	7,500
		..	210
		6,900	6,400
		25,600	20,100
		..	5,900
		8,200	18,200
		..	100
		14,200	10,600
		9,000	8,800
		7,800	6,200
		11,400	8,600
		..	1,500
		32,000	31,200
		42,040	2,800

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
10. *Boro* paddy, West Bengal	7,500 0 0	..	
11. Rice vernalization, Calcutta	208 15 6	(+)1 0 6(*a*)	(*a*) Inconsiderable
12. Manurial experiments on paddy lands, West Bengal	6,420 0 0	(—)20 0 0(*a*)	,,
13. Increasing rice yield, C.R.R.I.	20,117 0 0	(—)17 0 0(*a*)	,,
14. Preparation of a bulletin on the various experiments on rice at C.R.R.I.	5,830 0 0	(+)70 0 0(*a*)	,,
(*b*) WHEAT AND OTHER CEREALS			
15. Wheat breeding, Madhya Pradesh, Bombay and other centres	18,222 0 0	(—)22 0 0(*a*)	,,
16. Cereal rusts, Agra	77 4 0	(+)22 12 0(*a*)	,,
17. Maize breeding, Punjab	10,526 2 6	(+)73 13 6(*a*)	,,
18. Maize breeding, U.P.	8,809 0 0	(—)9 0 0(*a*)	,,
19. Maize breeding, Bihar	6,140 0 0	(+)60 0 0(*a*)	,,
20. Maize breeding, West Bengal	8,570 0 0	(+)30 0 0(*a*)	,,
21. Hybrid corn seed, Almora	1,500 0 0	..	
22. Maize Breeding, I.A.R.I.	31,241 0 9	(—)41 0 9(*a*)	,,
23. Co-ordinated Wheat Rust Control Scheme, Mycological at Simla/Delhi/Agra and Botanical at Delhi/Pusa/Simla/Indore	2,740 3 0	(+)59 13 0(*a*)	,,

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		8,500	6,800
		3,000	4,400
		2,400	2,000
		..	8,300
		5,700	..
		3,200	..
		2,700	2,200
		..	1,360
		..	9,650
		..	8,100
		11,300	13,800
		5,400	2,800
		..	100
		6,600	5,800
		..	150
		1,680	7,600

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
24. Maize breeding, Hyderabad	6,727 0 0	(+)73 0 0(*a*)	(*a*) Inconsiderable
25. Maize breeding, Rajasthan	4,380 0 0	(+)20 0 0(*a*)	,,
26. Maize breeding, PEPSU	1,970 0 0	(+)30 0 0(*a*)	,,
27. Maize breeding, Almora	8,256 0 0	(+)44 0 0(*a*)	,,
28. Wheat breeding, Rajasthan	..	..	
29. Barley Improvement, Rajasthan	..	..	
30. Sweet Corn, Punjab	2,200 0 0	..	
31. Improvement of pasture and legumes, I.A.R.I.	1,260 0 0	(+)100 0 0(*a*)	(*v*) Inconsiderable
(*c*) MILLETS AND PULSES			
32. Pulse breeding, Madras	9,620 6 6	(+)29 9 6(*a*)	,,
33. Pulse breeding, Bombay	8,204 0 0	(—)104 0 0(*a*)	,,
34. Pulse breeding, U.P.	12,723 0 0	(+)1,077 0 0(*c*)	(*c*) Payment of outstanding bills made in the next financial year
35. Pulse breeding, West Bengal	2,770 0 0	(+)30 0 0(*a*)	(*a*) Inconsiderable
36. Pulse Breeding, Bihar	78 0 0	(+)22 0 0(*a*)	,,
37. Pulse Breeding, Orissa	5,820 0 0	(—)20 0 0(*a*)	,,
38. Pulse Breeding, Assam	154 0 0	(—)4 0 0(*a*)	,,
39. Pulse Breeding, Hyderabad	7,596 0 0	(+)4 0 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		430	400
		1,140	..
		860	..
		740	11,000
		10,000	9,100
		1,000	11,000
		4,000	..
		4,450	..
		9,700	9,550
		..	120
		4,900	15,200
		..	9,300
		9,800	12,400
		26,500	6,300
		9,200	6,800
		4,700	4,200
		28,700	..
		1,830	6,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
40. Pulse Breeding, Madhya Bharat (Gwalior)	430 0 0	(—)30 0 0(*a*)	(*a*) Inconsiderable
41. Small millets, U.P.	..	..	..
42. Small millets, Mysore	..	..	..
43. Gram wilt disease, Punjab	10,920 0 0	(+)80 0 0(*a*)	,,
44. *Striga* attack on *Sorghum*, Madras	9,080 0 0	(+)20 0 0(*a*)	,,
45. Hybrid *cumbu*, Madras	10,990 0 0	(+)10 0 0	,,
46. Insect pests of stored cereal grains, Punjab	..	..	..
47. Gram pests, Madhya Pradesh	..	..	..
48. *Jowar* and *bajra* breeding, Saurashtra	9,550 0 0	..	..
(*e*) FRUITS			
49. Horticulture, Bihar	122 0 0	(—)2 0 0(*a*)	,,
50. Horticulture, Madhya Pradesh	15,124 0 0	(+)76 0 0(*a*)	,,
51. Horticulture, Assam	9,301 0 0	(—)1 0 0(*a*)	,,
52. Horticulture, Orissa	12,360 6 6	(+)39 9 6(*a*)	,,
53. Horticulture, Hyderabad	6,232 8 6	(+)67 7 6(*a*)	,,
54. Horticulture, Mysore	6,744 15 0	(+)55 1 0(*a*)	,,
55. Horticulture, Kashmir	4,200 0 0	..	,,
56. Horticulture, Himachal Pradesh	..	..	
57. Orange cultivation, Coorg	6,029 2 0	(—)29 2 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		..	13,300
		18,300	12,700
		5,800	6,500
		10,400	26,100
		..	..
		..	..
		4,700	4,500
		18,100	14,400
		800	6,800
		19,800	14,900
		9,900	5,200
		2,440	7,700
		..	200
		2,010	..
		..	1,600
		560	..
		460	..

XX—*contd.*

Council of Agricultural Research for the year 1952-53.

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
58. Mango necrosis, Lucknow	13,272 12 0	(+)27 4 0(*a*)	(*a*) Inconsiderable
59. Banana Research, Madras	12,677 0 0	(+)23 0 0(*a*)	,,
60. Banana Research, Bombay	6,460 0 0	(+)40 0 0(*a*)	,,
61. Banana Research, Bengal	26,060 0 0	(+)40 0 0(*a*)	,,
62. Yield data from fruit orchards, Madhya Pradesh	..	..	
63. Yield data from fruit orchards, Kashmir	..	..	
64. Citrus Manurial trials, Punjab	4,470 0 0	(+)30 0 0(*a*)	,,
65. Fruit Research Stations, U.P.	14,420 0 0	(—)20 0 0(*a*)	,,
66. Fruit preservation, Assam	6,800 0 0	..	..
67. Mycological and entomological investigations on fruits, U.P.	16,154 0 0	(—)1,254 0 0(*e*)	(*e*) Demand for funds received late in the year
68. Horticultural investigations, U.P.	5,130 0 0	(+)70 0 0(*a*)	(*a*) Inconsiderable
69. Insect pests of fruits, Uttar Pradesh	7,620 0 0	(+)80 0 0(*a*)	,,
70. Orange disease, Madras	178 0 0	(+)22 0 0(*a*)	,,
71. Research on orange, Madras	..	..	
72. Training in fruit preservation, Bihar	1,590 0 0	(+)10 0 0(*a*)	,,
73. Cashew-nuts, Madras	..	..	..
74. Cashew-nuts, Bombay	..	..	..

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		430	2,000
		1,79,330	
		..	..
		..	9,680
		8,100	4,800
		3,400	2,700
		7,400	6,200
		4,600	3,300
		3,000	3,900
		8,720	8,700
		4,000	2,400
		23,600	22,300
		8,300	1,800
		11,200	9,300
		82,320	
		..	10
		..	63
		..	14,300

XX—*contd.*

Council of Agricultural Research for the year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
75. Cashew-nuts, Travancore-Cochin	2,000 0 0	..	
(*f*) VEGETABLES			
76. Potato seed certification survey, I.A.R.I.	..	..	..
77. Potato storage pests, Bihar	9,680 0 0	..	..
78. Tuber crops, Bombay	4,775 8 0	(+)24 8 0(*a*)	(*a*) Inconsiderable
79. Tuber crops, Punjab	2,670 0 0	(+)30 0 0(*a*)	,,
80. Tuber crops, Bihar	6,199 0 0	(+) 1 0 0(*a*)	,,
81. Tuber crops, Orissa	3,320 0 0	(—)20 0 0(*a*)	,,
82. Tuber crops, Mysore	3,860 0 0	(+)40 0 0(*a*)	,,
83. Tuber crops, Madras	8,700 0 0	..	
84. Research on tomatoes, potatoes and other vegetables, B. H. U., Banaras	2,360 0 0	(+)40 0 0(*a*)	,,
85. Tapioca and sweet potato, Travancore-Cochin	22,300 0 0	..	..
86. Improvement of vegetables, Bombay	1,810 0 0	(—)10 0 0(*a*)	,,
87. Improvement of vegetables, U.P.	9,290 0 0	(+)10 0 0(*a*)	,,
(*g*) OTHER CROPS			
88. Training of officer (tobacco), Bombay	10 0 0	..	
89. Co-operative experiments on tobacco, Bombay	63 0 0	..	
90. Medicinal plants, Kashmir—Col. Chopra	14,240 0 0	(+)60 0 0(*a*)	,,

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		1,440	10,700
		13,000	8,000
		12,500	9,300
		550	2,500
		7,500	40
		1,200	1,000
		..	10,900
		1,380	4,200
		1,700	..
		16,000	..
		10,000	..
		..	3,500
		..	2,010
		1,800	..
		16,200	13,400
		6,380	5,700
		..	..
		12,200	9,900

XX—*contd.*

Council of Agricultural Research for the year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
91. Turmeric, Orissa .	10,659 0 0	(+)41 0 0(*a*)	(*a*) Inconsiderable
92. Cardamoms, Madras	8,017 1 0	(—)17 1 0(*a*)	,,
93. Pepper, Madras .	9,270 0 0	(+)30 0 0(*a*)	,,
94. Ginger, Madras .	2,480 0 0	(+)20 0 0(*a*)	,,
95. Chillies, Madras .	36 4 0	(+)3 12 0(*a*)	,,
96. Cloves, Travancore .	940 0 0	(+)60 0 0(*a*)	,,
97. Medicinal plants, F.R.I.	10,840 0 0	(+)60 0 0(*a*)	,,
98. Coriander diseases, M. B., Gwalior	4,200 0 0	..	
99. *Zira* diseases, Rajasthan	..	..	
100. Medicinal plants, Madras	..	..	
101. Medicinal plants, Bengal	..	..	
(*h*) Soils and Manures			
102. Storage of fertilizers, I.A.R.I.	3,500 0 0	..	
103. Sewage farming, Bangalore	2,000 0 0	(+)10 0 0(*a*)	,,
104. Control of erosion, Visya Bharti Institute	..	..	
105. Trace elements in Indian soils, I.A.R.I.	13,452 15 6	(—)52 15 6(*a*)	,,
106. Soil improvement in spent up orchards, U.P.	5,700 0 0	..	
107. Composting of manure	..	..	
108. Nitrogen fixation in soils, I.A.R.I.	9,846 10 0	(+)53 6 0(*a*)	,,

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		..	2,200
		19,000	..
		12,000	..
		25,300	15,800
		31,000	27,300
		29,200	..
		23,500	20,600
		1,900	1,600
		..	6,400
		1,78,480	
		..	1,300
		..	600
		..	
		..	900
		26,250	26,400
		..	11,400
		26,250	

XX—*contd.*

Council of Agricultural Research for the year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
109. Phosphatic manuring, I.A.R.I.	2,175 0 0	(+)25 0 0(*a*)	(*a*) Inconsiderable
110. Soil conservation, H. P.	..	..	..
111. Soil erosion, Rajasthan (Jaipur)	..	..	..
112. Manurial experiments, Madras	15,780 0 0	(+)20 0 0(*a*)	,,
113. Manurial experiments, West Bengal	27,300 0 0	..	
114. Manurial experiments, Orissa	..	..	
115. Manurial experiments, Bihar	20,620 0 0	(—)20 0 0(*a*)	,,
116. *Azotobacter* inoculation of crops, West Bengal	1,570 0 0	(+)30 0 0(*a*)	,,
117. Rapid soil test, I.A.R.I.	6,350 0 0	(+)50 0 0(*a*)	,,
(*i*) AGRONOMY			
118. Phenological observations, Poona	1,301 0 0	(—)1 0 0(*a*)	,,
119. Dry Farming, Madras	546 0 0	(+)54 0 0(*a*)	,,
(*j*) PHYSIOLOGY			
120. Wheat and sugarcane physiology, B.H.U., Banaras	812 5 0	(+)87 11 0(*a*)	,,
121. Plant Physiology—Shri Boshi Sen, U.P.	26,360 15 9	(+)39 0 3(*a*)	,,
122. Physiology of wheat, Delhi University	11,400 0 0	..	

APPENDIX

Annual Accounts of Income and Expenditure of the India

RECEIPTS			
Head of Account	Receipts during the year	GRANTS	
		Original	Net
		Rs.	Rs.
		..	140
		16,000	12,100
		..	4,700
		3,400	9,600
		..	4,500
		3,800	2,900
		..	2,700
		43,000	1,000
		66,200	
		26,100	13,000
		10,700	..
		7,400	..
		25,000	..
		69,200	
		29,000	25,700
		..	760
		..	4,800

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
(*k*) ENTOMOLOGY			
123. Survey of *Icerya purchasi*, I.A.R.I.	139 10 0	(+)0 6 0(*a*)	(*a*) Inconsiderable
124. Schools of research	12,110 0 0	(—)10 0 0(*a*)	,,
125. Termite research, F.R.I.	4,630 0 0	(+)70 0 0(*a*)	,,
126. Research on insecticides, Punjab	9,746 0 0	(—)146 0 0(*a*)	,,
127. Test with D.D.T., I.A.R.I.	4,489 8 0	(+)10 8 0(*a*)	,,
128. Test with D.D.T., Bombay	2,880 0 0	(+)20 0 0(*a*)	,,
129. Test with D.D.T., U.P.	2,690 0 0	(+)10 0 0(*a*)	,,
130. Weed control, Poona, Madras, Bombay, U.P. and West Bengal	1,000 0 0	..	,,
(*l*) MYCOLOGY			
131. Virus diseases, Poona	12,985 0 0	(+)15 0 0(*a*)	,,
132. Virus diseases, Simla	..	..	
133. Virus diseases, Delhi	..	..	
134. Schools of research	..	..	
(*m*) GENERAL			
135. Introduction of new economic plants, I.A.R.I.	25,683 15 0	(+)16 1 0(*a*)	,,
136. Crop seeds, Delhi University	759 10 0	(+)0 6 0(*a*)	,,
137. Bone meal, I.A.R.I.	4,800 0 0	..	

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		7,860	5,700
		..	4,100
		12,400	33,900
		42,600	41,300
		25,100	..
		35,320	10,000
		13,300	4,700
		11,100	9,800
		70,000	..
		5,000	5,300
		10,900	7,100
		..	1,300
		5,800	5,400
		2,700	..

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(i) *Agriculture*—contd.	Rs. as. p.	Rs. as. p.	
138. 'Monograph on Agriculture in Ancient India', I.A.R.I.	5,710 0 0	(—)10 0 0(*a*)	(*a*) Inconsiderable
139. Pre-soaking seeds in nutrient salts, Madras	4,100 0 0	..	
(ii) *Animal Husbandry*			
(*a*) Cattle Breeding			
1. Livestock investigation, Punjab	33,900 0 0	..	
2. Improvement of Kangayam breed of cattle, Madras	41,300 0 0	..	
3. Cattle improvement and insurance, PEPSU	..	..	
4. Causes of degeneration of Indian cattle, I.V.R.I.	10,000 0 0	..	
5. Pilot Key Village Scheme, U.P.	4,700 0 0	..	
6. Pilot Key Village Scheme, Travancore-Cochin	9,800 0 0	..	
7 & 8. Pilot Key Village Scheme, other centres	..	..	
(*b*) Goat and Sheep Breeding			
9. Goat Breeding, Punjab	5,263 6 6	(+)36 9 6(*a*)	(*a*) Inconsiderable
10. Goat Breeding, Cochin	7,100 0 0	..	
11. Goat Breeding, U.P.	1,903 0 0	(—)9 0 0(*a*)	,,
12. Goat Breeding, U.P.	5,345 0 0	(+)55 0 0(*a*)	,,
13. Sheep breeding, Madras	..	..	

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	GRANTS	
		Original	Net
		Rs.	Rs.
		20,670	..
		9,000	9,000
		7,130	7,700
		..	8,100
		95,000	15,300
		..	1,200
		..	1,500
		15,600	..
		40,700	45,000
		22,500	15,100
		24,300	20,000
		6,400	6,200
		..	..

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.	Rs. as. p.	Rs. as. p.	
14. Sheep breeding, Bombay	..	..	
15. Sheep breeding, Punjab	8,996 12 0	(+)3 4 0(*a*)	(*a*) Inconsiderable
16. Sheep breeding, Kashmir	7,712 5 6	(—)12 5 6(*a*)	,,
17. Sheep and wool improvement on regional basis, U.P.	..	(+)8,100 0 0(*k*)	(*k*) Demand for funds not received during the year
18. Sheep and wool improvement on regional basis, Bombay	15,260 0 0	(+)40 0 0	
19. Training in sheep and wool production, Punjab	1,140 0 0	(+)60 0 0(*a*)	(*a*) Inconsiderable
20. Farm breeding Bikaneri sheep, Punjab	1,415 12 6	(+)84 3 6(*a*)	,,
(*c*) Animal Nutrition			
21. Animal nutrition, Madras	..	..	
22. Animal nutrition, Bombay	44,910 0 0	(+)90 0 0(*a*)	,,
23. Nutritive value of leafy fodders, I.V.R.I.	15,100 1 6	(—)0 1 6(*a*)	,,
24. Influence of trace elements on the health and production capacity of livestock, I.V.R.I.	20,000 0 0	..	
25. Standardisation of rations for *ryots*, cattle, Orissa	6,336 4 0	(—)136 4 0(*a*)	,,
26. Drying of young grass, Bombay	1 0 0	(—)1 0 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		3,600	800
		8,300	..
		6,200	..
		5,300	2,500
		810	5,500
		700	6,500
		5,000	..
		1,000	4,200
		500	3,000
		500	4,900
		310	4,900
		..	100
		4,400	3,200
		..	1,260
		5,000	36,800

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.	Rs. as. p.	Rs. as. p.	
(*d*) ANIMAL PESTS DISEASES AND CURE			
27. Veterinary Investigation Officer (Cattle), Travancore-Cochin	780 0 0	(+)20 0 0(*a*)	(*a*) Inconsiderable
28. Veterinary Investigation Officer (Cattle), Rajasthan	..	..	
29. Veterinary Investigation Officer (Cattle), Kashmir	8,510 0 0	+90 0 0(*a*)	,,
30. Veterinary Investigation Officer (Cattle), Mysore	2,500 0 0	..	
31. V. I. O. (Sheep and Goats), Bombay	5,460 0 0	(+)40 0 0(*a*)	,,
32. V. I. O. (Sheep and Goats), Madras	6,457 0 0	(+)43 0 0(*a*)	,,
33. V. I. O. (Sheep and Goats), West Bengal	..	..	
34. V. I. O. (Sheep and Goats), Punjab	4,201 8 0	(—)1 8 0(*a*)	,,
35. V. I. O. (Sheep and Goats), Bihar	3,000 0 0	..	
36. V. I. O. (Sheep and Goats), Orissa	4,845 0 0	(+)55 0 0(*a*)	,,
37. V. I. O. (Sheep and Goats), Mysore	4,850 0 0	(+)50 0 0(*a*)	,,
38. V. I. O. (Sheep and Goats), Baroda	106 0 0	(—)6 0 0(*a*)	,,
39. V. I. O. (Sheep and Goats), U. P.	3,160 0 0	(+)40 0 0(*a*)	,,
40. Johne's disease among cattle, Mysore	1,253 14 6	(+)6 1 6(*a*)	,,
41. Tuberculosis and Johne's disease among animals, I.V.R.I.	36,714 12 0	(+)85 4 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	GRANTS	
		Original	Net
		21,500	15,100
		6,000	28,200
		6,680	15,000
		5,810	150
		1,850	..
		2,000	..
		..	4,050
		820	19,600
		..	..
		9,000	..
		..	300
		..	100
		1,170	..
		24,200	7,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.			
42. Helminth parasites, I.V.R.I.	15,054 15 0	(+)45 1 0(*a*)	(*a*) Inconsiderable
43. Vaccination against foot and mouth diseases, I.V.R.I.	28,525 10 0	(—)325 10 0(*a*)	,,
44. Damage caused by ticks and warble flies, I.V.R.I.	14,928 4 0	(+)71 12 0(*a*)	,,
45. Toxicology of Indigenous drugs of India, Madras	152 0 0	(—)2 0 0(*a*)	,,
46. Helminthiasis in cattle, Madras	..	..	
47. Helminthiasis in cattle, Lucknow University	..	..	
48. Helminthiasis in cattle, West Bengal	3,997 0 0	(—)53 0 0(*a*)	,,
49. Diseases caused by anaerobes, I.V.R.I.	19,550 0 0	(+)50 0 0(*a*)	,,
50. Tuberculin testing, Bombay and Punjab	3,450 0 0	(—)3,450 0 0(*a*)	,,
51. Tuberculin testing, Bihar	..	..	
52. Indigenous drugs used in veterinary medicines, Northern India	271 7 3	(+)28 8 9(*a*)	,,
53. Bearing of nutrition on helminthic infection, I.V.R.I.	68 8 0	(+)31 8 0(*a*)	,,
54. Indigenous drugs used in veterinary medicines, Madras.	..	..	
55. Control of Bovine Pleure Pneumonia, Assam.	7,000 0 0	..	

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		4,100	1,100
		..	800
		..	4,300
		3,600	2,400
		30,500	19,200
		..	180
		15,000	..
		..	..
		8,910	1,100
		1,870	..
		..	100
		..	..
		17,730	19,100

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.			
56. Investigation of mastitis, Bombay	3,933 3 0	(—)2,833 3 0(*e*)	(*e*) Demand for funds received late in the year
57. Investigation of mastitis, I.V.R.I.	750 0 0	(+)50 0 0(*a*)	(*a*) Inconsiderable
58. Investigation of mastitis, Punjab	4,310 0 0	(—)10 0 0(*a*)	,,
59. Investigation of mastitis, Mysore	2,370 0 0	(+)30 0 0(*a*)	,,
60. Use of lapinised virus against rinderpest, I.V.R.I.	19,200 0 0	..	
(*e*) DAIRYING			
61. Quality improvement in milk and milk products, Allahabad	183 2 0	(—)3 2 0(*a*)	,,
62. Rapid determination of fats, etc., in milk, Bombay	..	..	
63. Rapid determination of fats, etc., in milk, Bihar	..	..	
64. Rapid determination of fats, etc., in milk, West Bengal	1,030 0 0	(+)70 0 0(*a*)	,,
65. Rapid determination of fats, etc., in milk, Punjab	..	..	
66. Standardising methods for the analysis of ghee, I.D.R.I.	75 4 0	(+)24 12 0(*a*)	,,
67. Bacteriological quality of market milk, West Bengal	..	..	
68. Standardisation of the technique of manufacture to improve the market quality of ghee, I.D.R.I.	20,168 6 0(*e*)	(—)1,068 6 0(*e*)	(*e*) Demand for funds received late in the year

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		..	3,430
		..	1,400
		4,400	..
		1,730	..
		3,300	4,500
		28,190	26,300
		1,570	6,800
		..	..
		..	6,100
		240	1,500
		..	14,700
		..	900
		6,500	700
		..	200

XX—*contd.*

Council of Agricultural Research for the Year 1952-53.

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.			
69. Analysis of milk, I.D.R.I.	3,546 0 0	(—)116 0 0(*a*)	(*a*) Inconsiderable
70. Analysis of milk, Bombay	1,380 0 0	(+)20 0 0(*a*)	,,
71. Analysis of milk, U.P.	..	..	
72. Analysis of milk, Bihar	..	..	
73. Analysis of milk, Institute of Hygiene and Public Health	4,514 2 0	(—)14 2 0(*a*)	,,
74. Heat resistant flora in Indian milk, I.D.R.I.	27,982 6 6	(—)1,682 6 6(*e*)	(*e*) Demand funds received late in the year
75. Glyceride structure of ghee, I.I.Sc.	6,744 15 0	(+)55 11 0(*a*)	(*a*) Inconsiderable.
76. Bacteriological quality of milk, I.D.R.I.	537 0 0	(—)537 0 0(*e*)	(*e*) Demand funds received late in the year
(*f*) Wool			
77. Wool analysis, Bombay University	6,102 12 6	(—)2 12 6(*a*)	(*a*) Inconsiderable
78. Wool analysis, Bihar	1,500 0 0	..	
79. Sampling wool for measurement of quality I.C.A.R.	14,758 14 0	(—)58 14 0(*a*)	,,
80. Training in flays, West Bengal	826 0 0	(+)74 0 0(*a*)	,,
(*h*) Poultry			
81. Influence of climate on performance of *desi* fowl, I.V.R.I.	645 6 0	(+)54 10 0(*a*)	,,
82. Diseases of poultry, M.P.	173 0 0	(+)27 0 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		..	500
		17,200	12,700
		8,250	6,100
		..	7,200
		5,100	..
		10	..
		..	5,220
		6,400	5,000
		7,500	6,800
		6,200	6,900
		300	4,500
		900	..
		7,150	..
		..	3,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
(ii) *Animal Husbandry*—contd.	Rs. as. p.	Rs. as. p.	
83. Diseases of poultry, U.P.	500 0 0	..	
84. Poultry research, M.P.	12,681 0 0	(+)19 0 0(*a*)	(*a*) Inconsiderable
85. Poultry research, Travancore-Cochin	6,060 0 0	(+)40 0 0(*a*)	„
86. Helminth parasites affecting poultry, I.V.R.I.	7,151 9 3	(+)48 6 9(*a*)	„
87. Duck breeding, Bihar	..	..	
(*i*) FISH			
88. Rural pisciculture, Madras	..	..	
89. Semi-dried prawns, Madras	5,217 0 10	(+)2 15 2(*a*)	„
90. Pisicultural research, Annamalai University	4,940 0 0	(+)60 0 0(*a*)	„
(*j*) APICULTURE			
91. Regional Bee-Research Station, Punjab	6,796 0 0	(+)4 0 0(*a*)	„
92. Regional Bee-Research Station, Madras	6,835 0 0	(+)65 0 0(*a*)	„
(*k*) GENERAL			
93. Using cows for work, I.D.R.I.	4,689 0 0	(—)189 0 0(*a*)	„
94. Using cows for work, Mysore	..	..	
95. Using cows for work, I.V.R.I.	..	..	
96. Characteristics of Dangi and Nimari cattle, etc., Bombay	3,000 0 0	..	

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		10,000	100
		1,000	..
		5,150	5,150
		..	1,800
		17,580	4,000
		..	150
		..	..
		..	6,000
		..	700
		..	2,000
		..	2,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
	Rs. as. p.	Rs. as. p.	
(iii) *Combined Agricultural and Animal Husbandry Schemes Development*			
1. Village projects, Baroda	74 10 0	(+)25 6 0(*a*)	(*a*) Inconsiderable
2. Milk yielding trees, Bombay	..	..	
3. *Kudzu* vine, I.A.R.I.	5,140 0 0	(+)10 0 0(*a*)	,,
(iv) *Miscellaneous Schemes*			
1. Cropcutting experiments on paddy and wheat	1,751 0 0	(+)49 0 0(*a*)	,,
2. Requirements of labour and material for cotton and rotation crops, M.P.	3,836 1 0	(+)163 15 0(*a*)	,,
D. CONTRIBUTION TO OTHER SCIENTIFIC INSTITUTIONS			
(i) *Indian*			
1. Subsidy to Rural India	154 4 0	(—)4 0 0(*a*)	,,
2. Indian Bee-Keepers' Association	..	..	
3. Current Science Association	6,000 0 0	..	
4. Indian Society of Genetics and Plant Breeding	695 8 0	(+)4 8 0(*a*)	,,
5. The Indian Dairy Science Association	2,000 0 0	..	
6. The Entomological Society of India	1,955 6 0	(+)44 10 0(*a*)	,,

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		..	1,500
		..	10
		..	500
		..	300
		..	510
		..	28,600

XX—*contd.*

Council of Agricultural Research for the Year 1952-53.

PAYMENTS

Name of Scheme and Head or Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
	Rs. as. p.	Rs. as. p.	
(i) *Indian*—contd.			
7. Publishing the report on the progress and control of the desert of locust cycle	1,500 0 0	..	(a) Inconsiderable
8. Indian Society of Agri. Economics	..	(—)10 0 0(*a*)	,,
9. Indian Society of Agri. Statistics	551 8 0	(—)51 8 0(*a*)	,,
10. The Indian Journal of Helminthology	289 11 0	(+)10 5 0(*a*)	,,
11. Indian Poultry Club	519 13 0	(—)9 13 0(*a*)	,,
(ii) *Commonwealth and Imperial*			
12. Commonwealth Agricultural Bureaux 13. Imperial Institute of Mycology 14. Imperial Institute of Entomology 15. Farnham House Laboratory 16. Imperial Bureaux of Dairy Science 17. Fruit Preservation Research Station, Campden	28,560 0 0	(+)40 0 0(*a*)	,,

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		1,500	2,800
		115,000	65,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
	Rs. as. p.	Rs. as. p.	
E. DEBTS AND REMITTANCES			
1. *Loans and advances to the Council's servants*			(*a*) Inconsiderable
Repayment of:			
(i) Motor car advances	..	..	
(ii) Motor Cycle advances	1,400 0 0		
(iii) Bicycle advances .	1,330 0 0		
(iv) Miscellaneous .	..		
	2,730 0 0	(+)70 0 0 (*a*)	
2A. *Deposit of I.C.A.R. Provident Fund*			
(i) Advances from subscription to the Fund	5,656 0 0		
(ii) Repayment of subscription	15,290 10 0		
(iii) Payment of Interest	2,128 2 0		
(iv) Suspense . .	6 2 0		
(v) Miscellaneous .	7 15 0		
	23,088 13 0		
2B. *Other deposits and advances repayable*			
(i) Library deposits .	..		
(ii) Permanent advances	350 0 0		
(iii) Caution money Repayments	39 6 0		
(iv) Suspense . .	4,573 0 9		
(v) Other deposits and advances	37,678 13 9		"
	42,641 4 6		
Total	65,730 1 6	(—)730 1 6 (*a*)	

APPENDIX

Annual Accounts of Income and Expenditure of the Indian

RECEIPTS			
Head of Account	Receipts during the year	Grants	
		Original	Net
		Rs.	Rs.
		5,000	21,000

XX—*contd.*

Council of Agricultural Research for the Year 1952-53

PAYMENTS

Name of Scheme and Head of Account	Expenditure during the year	Excess (—) or Savings (+) over net grant	Remarks
	Rs. as. p.	Rs. as. p.	
3. *Remittances*			
(*a*) Of G. P. and other Provident funds	18,114 9 0		
(*b*) Of Income Tax .	4,840 7 0		
(*c*) Of other Miscellaneous recoveries	2,312 2 0		
	25,267 2 0	(—)4,267 2 0(*g*)	(*g*) Excess is due to more advances paid for Nilokheri Centre than anticipated
TOTAL .	35,57,052 8 5		
Investment and Reinvestment	40,79,943 14 8		
Repayment of Linseed Fund	31,966 14 11		
Closing balance . .	18,50,719 3 4		
GRAND TOTAL .	95,19,682 9 4		

APPENDIX XX—*contd.*

Advances

	Rs.	as.	p.
1. Permanent advance with the Secretary, I.C.A.R.	900	0	0
2. Permanent advance with the Rural Development Officer, I.C.A.R.	200	0	0
TOTAL .	1,100	0	0

Securities

Particulars of Securities, etc.	Face Value	Purchase Value
	Rs.	Rs. as. p.
1. 3 per cent. 2nd Victory Loan, 1959-61 . . .	5,00,000	5,03,125 0 0
2. 3 per cent. Victory Loan, 1957	(i)16,62,800	17,27,753 2 0
	(ii)1,93,400	1,99,983 14 10
3. 3 per cent. stock, 1963-65	16,49,500	15,54,334 0 0
4. 2¾ per cent. stock, 1962	(i)4,00,000	4,02,736 9 0
	(ii)5,50,000	5,50,000 0 0
5. 2½ per cent. loan, 1954	15,10,600	14,93,605 12 0
6. Four fixed Deposit Receipts No. D. 70778-81, repayable at a week's notice.	2,00,000	2,00,000 0 0
7. 2½ per cent. loan, 1955	15,97,100	14,99,950 6 0
8. Fourteen short term Deposits for rupees seven lacs, repayable at a week's notice. No. E. 27292-305	7,00,000	7,00,000 0 0
9. Twenty short term Deposit Receipts, No. 27440-59, repayable at a week's notice	10,00,000	10,00,000 0 0
10. Five short term Deposits for rupees one lac each, No. E. 27496-500, repayable at a week's notice	5,00,000	5,00,000 0 0
11. Three short term Deposit Receipts No. 27780-82 for rupees one lac each, repayable at a week's notice	3,00,000	3,00,000 0 0
12. Ten Treasury Deposit Receipts No. J. 001085 to J. 001094 for rupees one lac each, repayable after 12 months	10,00,000	10,00,000 0 0
13. Five short term Deposit Receipts No. E. 93063-67 for Rs. 50,000 each repayable at a week's notice	2,50,000	2,50,000 0 0
14. 3 per cent. Government of India loan, 1970-75 .	25,00,000	28,64,800 0 0
15. 12-year National Savings Certificates No. NS/FO-087031-35 and 087037-41	50,000	50,000 0 0
16. 12-year National Savings Certificates No. NS/FO-028496 and 97, 063601-10	60,000	60,000 0 0
17. 12-year National Savings Certificates No. NS/FO-087258-63	30,000	30,000 0 0
TOTAL .	1,46,53,400	

APPENDIX XX—*concld.*

Closing Balance

Particulars of Closing Balances	Amount Rs. as. p.
(1) Cash in hand with the Secretary, I.C.A.R. . .	500 0 0
(2) Cash in hand with the Rural Development Officer, I.C.A.R.	200 0 0
(3) Cash in hand with the I/C., C.M.D., I.C.A.R. . .	400 0 0
(4) In current account with Imperial Bank of India, New Delhi and Post Office	18,00,211 1 7
(5) Cash in hand	50,508 1 9
(6) Securities	1,46,53,400 0 0
GRAND TOTAL . .	1,65,05,219 3 4

J. V. A. NEHEMIAH,

Secretary,

Indian Council of Agricultural Research.

The accounts have been examined and according to best of my information and in consideration of the explanation given as a result of test audit of the accounts, they are correct.

H. C. SENGUPTA,

Asst. Examiner,

Central Revenues.

MGIPC—M—1-MFA/54—8-12-54—1,670.